CTC®

Compression
Techniques
Corporation

T-STAR 2000

Communications Analyzer

Dual E1 Interface

USER'S MANUAL

MP MASTER
MA32203

T-STAR 2000

Communications Analyzer

Dual E1 Interface

USER'S MANUAL

Software Version 1.xx

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CHAPTER 1

INTRODUCTION TO THE T-STAR 2000

GENERAL

This guide describes the T-STAR 2000 and provides instruction on how to set it up and perform In-Service and Out-Of-Service tests on E1 facilities.

The T-STAR 2000 is a lightweight, battery-operated test set optimized for monitoring, testing, and troubleshooting E1 span lines, channel banks, trunk circuit, and digital switches. It includes E1 line transmission, E1 bit error performance; and VF channel access signaling, supervision, dialing and transmission testing capabilities.

The test set is menu-driven and operated from a simple keyboard with push-button controls grouped functionally in an easy-to-use arrangement. The operator simply patches to the circuit under test and presses a MONITOR (In-Service) or TEST (Out-Of-Service or Drop/Insert) key. Related test setups, framing, and line code synchronization occur automatically, with test data appearing ON SCREEN immediately.

A data memory facility in the T-STAR includes an EVENT LOGGING function to record error and alarm events continually or over selected time periods. Recorded test results can be reviewed on screen or transferred to a printer for a hardcopy record.

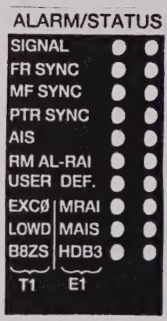
TESTING AND MONITORING CAPABILITIES

The T-STAR performs tests on E1 facilities in a DSX Monitor or BRIDGED mode (In-Service) or TERMINATED mode (Out-Of-Service). In addition, it performs VF channel signaling, dialing, and transmission tests in a drop/insert mode, with the E1 line In-Service.

A. E1 ALARM AND SIGNAL MONITORING

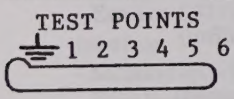
The T-STAR is equipped with front panel LED lamps to indicated signal status and alarm conditions of E1 circuits during In-Service monitoring and Out-Of-Service testing. In addition, there are six TTL interface pin jacks (test points) to connect external equipment, such as a digital counter or recorder, to the E1 alarm and signal monitoring functions of the T-STAR.

INDICATOR LAMPS (LED):



- SIGNAL
- FR SYNC
- MF SYNC
- PTR SYNC
- AIS
- RM AL-RAI
- USER DEF.
- MRAI
- MAIS
- HDB3

IN JACK TEST POINTS (TTL Level):



PIN	Function
	Ground
1	t.b.d. (to be defined)
2	t.b.d.
3	t.b.d.
4	t.b.d
5	t.b.d.
6	t.b.d.

In addition to the front panel indicators and side panel jacks, the T-STAR contains and EVENT LOGGING memory file. When the EVENT LOGGING function is activated during testing, E1 circuit

E1 BER Test Functions:

Types of Measurements - Same as IN-SERVICE, plus LOGIC & FE1
Measurement Formats - Same as IN-SERVICE, plus....
CCITT G.821 - Severely Errored Seconds
Severely Errored Seconds
Degraded Minutes
% Degraded Minutes
Unavailable Seconds
% Availability
Available Seconds

Test Patterns (Framed/Unframed
QRSS (Quasi-Random Signal Sequence) - 2E20-1 bits with no than 14 consecutive zeros.
PRBS (Pseudorandom) - 63, 511, 2047, 2E15-1, 2E20-1 bits
FIXED - 1:1 (10)
1:3 (1000)
1:7 (1000000)
1:15 (1 followed by 15 zeros)
1:31 (1 followed by 31 zeros)
2 in 8 (01000010)
3 in 24 (3 "ones" in 24 bits)
All Ones.
USER Programmable - from 1 to 32 Bytes patterns
(with 5 memory files)

Error Injection - BPV's, FAS(Frame Alignment Signal) & Logic; Auto or manual.

D. TWO-WAY DROP/INSERT TEST FUNCTIONS

The DROP/INSERT test function in the T-STAR allows 2-way access, troubleshooting and testing of any single channel on a live E1 circuit, without disturbing the remaining 23 channels, or on a E1 circuit that is not in service (e.g. preservice testing on a new digital trunk).

In this mode, T-STAR E1 inputs can be bridged onto both sides of a live circuit (e.g. DSX MON jack), with the outputs also connected to both sides in a thru/insert mode (this patching will cause a momentary "hit", but should not cause an alarm).

After connecting to the E1 circuit in a Drop/Insert mode, the T-STAR can be used to perform signaling, dialing, talk/listen and transmission tests on any selected 2-way VF channel in either direction and also on nx64kb/s data drop and insert thru aq seperate data port.
In addition, the T-STAR is equipped with VF and E/M test port to connect external VF transmission and E & M signaling test sets to individual channels.
The Drop/Insert test function is activated by pressing the DROP/INSERT key under TEST.

DROP/INSERT Test Functions/Facilities:

- Independent channel selection (E-F inputs).
- Display AB or ABCD signaling bit status (selected channel).
- Control outgoing AB or ABCD bits signaling and supervision.
- Generate test tones (404, 1004 ,1804, 2150, 2804, 2713 Hz).
- Measure level & frequency of channel signals, test tones & noise.
- VF-IN jack to connect external signal generator to outgoing DSO channels . Also used to apply external VF signals to the frequency & level measuring circuits of the T-STAR (T-STAR must be set to TERM mode to use this function).
- VF-OUT jacks to connect external transmission measuring test (TMS) to selected incoming VF channels (E-F). Also used to connect internal test tones to VF circuits for transmission testing.
- E/M jacks to connect external signaling test set to signaling leads of VF channel.
- Telephone keypad with speaker and microphone.
- Dial or ring, talk & listen over VF channel, or "hold" channel for testing.
- PCM Channel Loopback (optional).

E. SPECIAL CAPABILITIES

The following special features are built into the T-STAR to facilitate testing, monitoring and recording of E1/E1 and channel test results.

Autoconfiguration:

T-STAR automatically synchronizes with incoming E1 signal framing formats (D4, ESF or Unframed) and line codes (AMI or B8ZS).

CSU/Smart Jack Loop Up/Down Codes:

Operates line loopback switches at far end of test circuit (standard CSU or user programmable codes, up to 8 bits, are provided).

CSU Auto Loopback Simulation:

T-STAR internal loopback switch responds to standards CSU loop up/loop down codes sent from far end.

Event Logging:

Logs E1 bit error test results and selected E1 line or VF channel measurements over 14 discrete time periods ranging from 1 minute to 48 hours, with alarm events reported and time/date stamped as they occur. Logging function can also be set to record and time/date stamp bit errors continually.

Remote Control:

Provides remote control of T-STAR functions from DEC, WYSE or equivalent video display terminal (DEC VT52, VE100, VT200 or Wyse 50/85).

Printer Function:

Provides a means of externally printing alarm events and test results.

Alarms Signaling:

Generate RAI, MFRAI,AIS and MFAIS alarms.

F. INTERFACE FEATURES & CONTROLS

The T-STAR is equipped with a full selection of E1 and channel interface features, connectors and controls to access and test all types of E1 systems and trunk or VF channel facilities with standard E1 signaling, framing, line codes, and channel formats. This includes span lines, channel banks, digital switches, and PBX's.

Signal Format:

E1 PCM, 2.048 Mbps, 30 channel, or FE1 (optional)

Framing Formats**:

CAS, CCS (with & without CRC), Unframed.

Line Codes**:

AMI (Bipolar), HDB3

** T-STAR automatically synchronizes with all these formats; and AMI/HDB3 line codes.

E1 Interface Modes:

Terminate, Bridge, DSX Monitor, and Drop/Insert (terminate, bridge, and DSX Monitor).

Network Interface:

LBO (0, -6, -12dB); E1 span simplexed DC power loop; DB-15 and RJ-48C connectors; CSU loopback switch emulation.

Connectors/Controls:

E1 LINE FUNCTIONS

IN/OUT.....E(Equipment), F(Facility) bantam jacks.
DB-15/RJ-48C.....Network interface connectors (parallel E or F IN/OUT bantam jacks).
EXT.CLK.....BNC connector for external reference clock.
DC LOOP.....Toggle switch to OPEN/CLOSE span power DC Loop Circuit.
E1 Test Points..Pin Jack access to E1 status monitoring functions (6 test points & ground, TTL levels).

VF FUNCTIONS

IN/OUT.....Bantam jacks E and F for external test sets or to connect 4-wire analog circuit to T-STAR.
E/M.....Bantam jacks E and F for signaling test set.
LEV.ADJ...Screwdriver adjustments for VF IN/OUT circuit.
VOLUME.....Volume controls (E and F) for internal speaker.
MIC.....E or F microphones.

G. OPTIONAL FEATURES

The T-STAR is designed to accept optional features that expand its capabilities to meet additional or future E1 testing needs. Following is a list of T-STAR 2000 options that are currently available.

Customers requiring functions not listed below are urged to contact Compression Techniques Corporation (CTC) for additional information about the expansion possibilities of their T-STAR.

Fractional E1:

Bit error testing or Fractional E1 (FE1) circuits.

Wink Timer:

Measure wink delay and wink duration on trunk circuits that use wink timing signaling.

Dialed Digit Display:

Display telephone numbers decoded from signaling bits in selected channel.

Pulse Shape Analysis

Capture T1 pulse and displays it or prints over the DSX-1 template with shape analysis.

III

CHAPTER 2

DESCRIPTION OF THE T-STAR 2000

Operating the T-STAR is easy once you fully understand the connectors and controls on the left SIDE PANEL and the pushbutton controls and associated menu functions, screen display, alarm and signal indicators, and the dial function with keypad on the FRONT PANEL.

SIDE PANEL CONTROLS & CONNECTORS

All input/output connectors, certain controls, and the speaker and microphones are located on the left side panel of the T-STAR (see Figure 2-1).

E1 Line Functions

Controls

DC LOOP -Toggle switch to OPEN and CLOSE a DC path for simplexed current loops used in metallic E1 span lines. Control must be set to CLOSED position when T-STAR terminates a E1 span with DC current on the line.

Connectors

IN/OUT -Bantam jacks to connect the T-STAR to both sides of a E1 circuit. The impedance of the IN jack circuits can be set to 120(75 for unbalanced)ohms (terminating) or to greater than 5k ohms (bridging and DSX monitoring).

DB-15 -IN/OUT connector for use at Network Interface to terminate a E1 line for testing (parallels the IN/OUT bantam jacks for the side currently selected).

RJ-48C -Same DB-15 (alternate connector).

EXT-CLK -BNC connector for external clock source (e.g. E1 network clock).

E1 Test Points -Six pin jacks (TTL voltage level, 0 or +5VDC) to connect a recorder or plotter for external monitoring of specified alarm and signal conditions of E1/E1 circuit under test.

VF Functions

Controls

LEV.ADJ -Slotted screwdriver controls to adjust gain or loss of VF IN/OUT circuit. The circuit is set to 0 dB in the factory.

SPKR VOL - volume control for speaker.

MIC -Microphone for selected Eor F Side output channel

Connectors

IN -Bantam jack to connect external VF test signals to outgoing E1 time slot; or to T-STAR VF measuring circuits.

OUT -Bantam jack to connect external VF measuring equipment to incoming VF signals in E1 time slot; or to connect T-STAR VF test tones to external VF circuit for transmission testing.

E/M -Bantam jack to monitor E lead and control M lead signaling in selected VF channels using external E&M test set.

Utility Functions

Controls

CONTR -Contrast control for liquid crystal display.
POWER -Power ON/OFF switch.

Connectors

AC POWER
Locking-type connector for AC to DC Power Adapter.

RS-232 SERIAL PORT

Standard female 25-pin EIA serial interface for external printer, terminal or modem (used with the Remote Control). ANSI

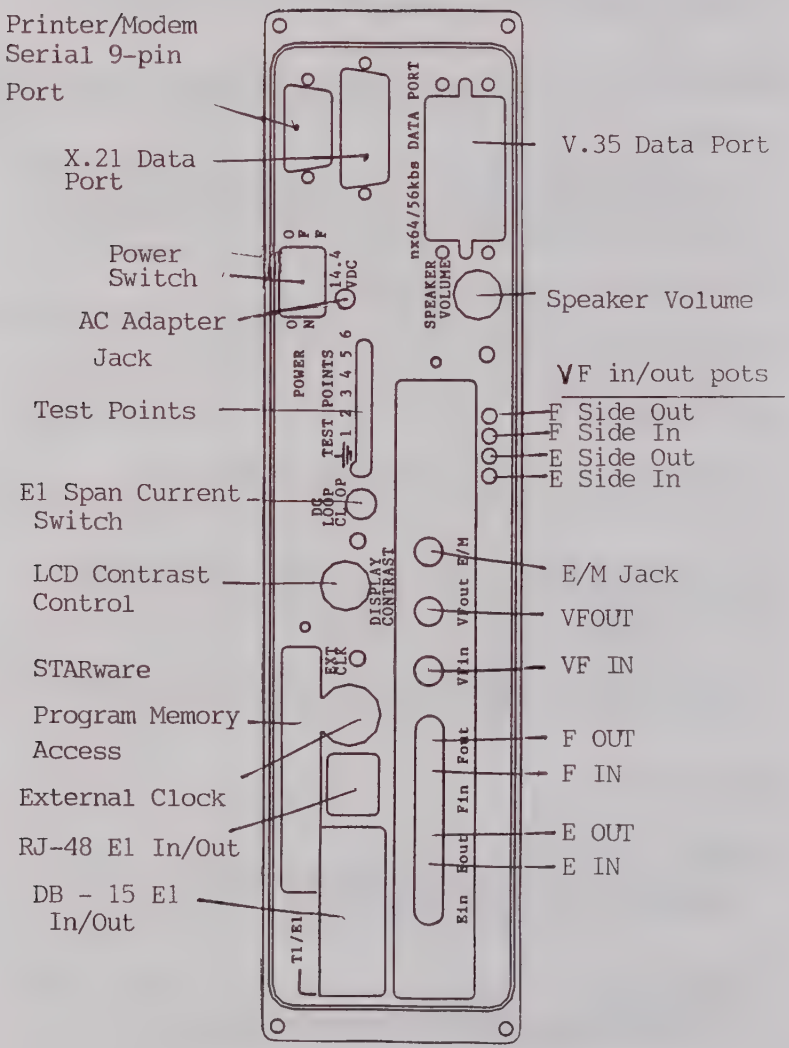


Figure 2-1. T-STAR 2000 Side Panel Controls & Connectors

FRONT PANEL CONTROLS & INDICATORS

Most of the T-STAR controls and indicators used to perform tests on E1 facilities are located on the front panel (Figure 2-2). The front panel contains 40 of LED monitoring lamps, a liquid crystal display (with cold-cathode backlight), 5 dual-function keys (F1-F5), 16 operating keys (6 SET-UP, 3 MONITOR, 3 TEST, and 4 special function keys), and a DIAL function keypad.

LED Monitoring Lamps (E and F sides)

PULSES	GREEN; turns on when E1 signal is detected.
FR SYNC	GREEN; turns on when frame synchronization is detected.
MF SYNC	GREEN; turns on when multiframe synchronization is detected
PTR SYNC	GREEN; turns on in BER mode only when Pattern synchronization is detected
AIS	RED; turns on when alarm indication signal (umframed all_ 1's) is detected.
RM AL	YELLOW; turns on when remote alarm is detected.
USER DEF	RED; multichoice menu - to be defined
EXC0	RED; turns on when average zero density exceeds 12.5%
LOWD	RED; turns on when average zero density exceeds 7 zero's
B8ZS	RED; turns on when signal contains B8ZS code

Liquid Crystal Display (LCD)

The viewing screen on the T-STAR is a 16-line x 26-character. The screen is constantly backlit with a cold cathode type source of light, which provides high intensity and long life at the same time. The resulting contrast , brightness and viewing angle rivals that of the CRT display.

The screen displays the time and date, test mode, test setups, menu selections, test results, and other information related to each test function selected by the operator (Figure 2-3). The input mode, line code, and frame format initially appear in lower case letters. When the input sig-

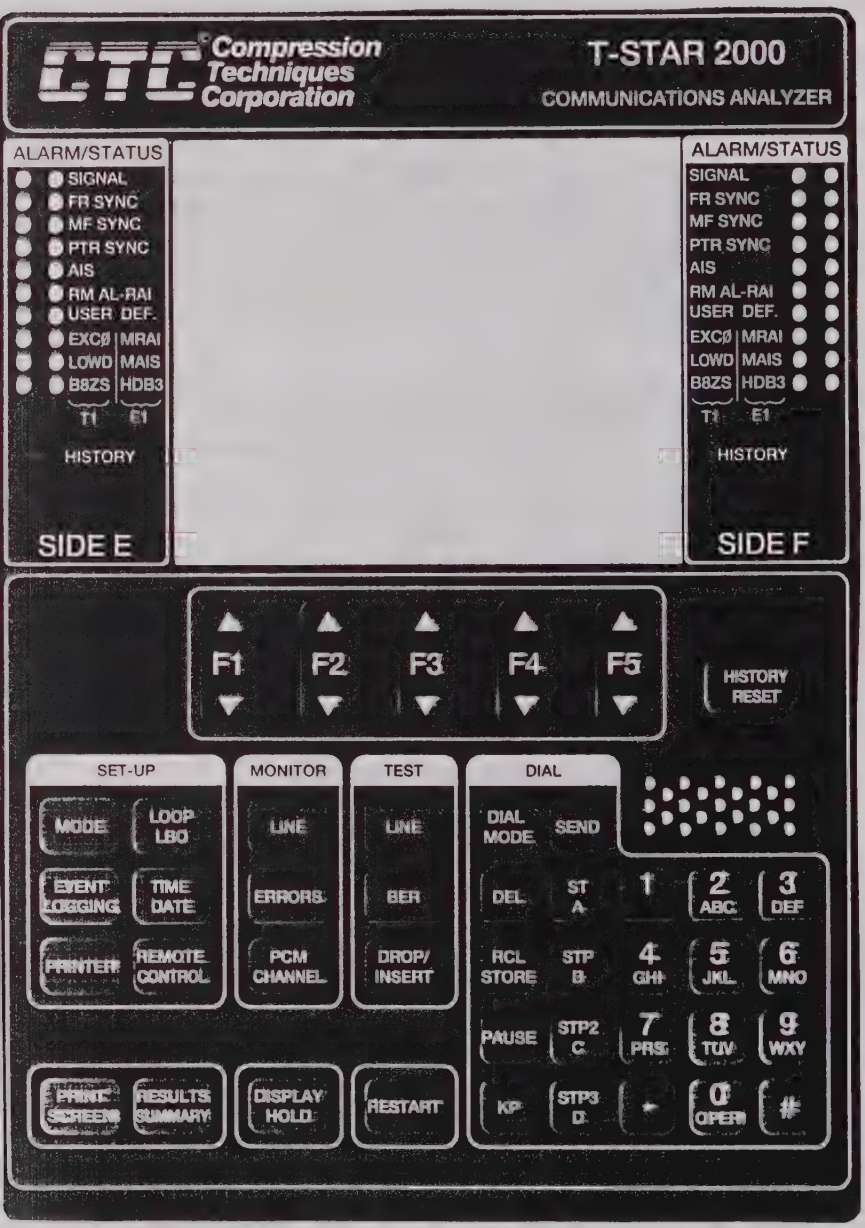


Figure 2-2. Front Panel

Liquid Crystal Display (LCD)

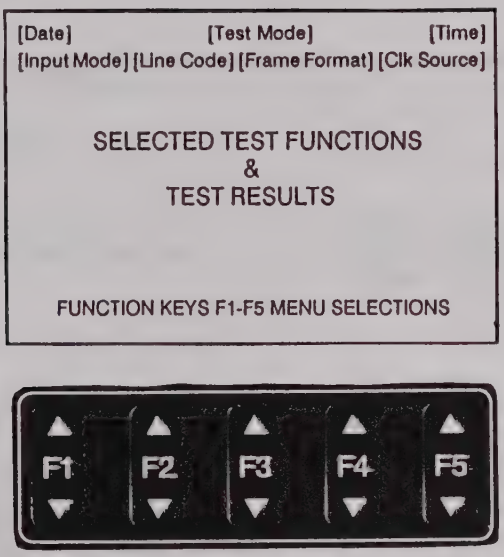


Figure 2-2. Screen Display Layout

nal conditions are identified by the T-STAR, the letters turn to upper case.

Dual-Function Keys (F1-F5)

The Dual-Function keys, labeled F1 thru F5, are used to select the menu choices associated with the 16 operating keys and the DIAL keys. The function keys are used in the following two ways, according to which operating or DIAL key is pressed:

#1 Each half of a Dual-Function key is assigned to the same menu (e.g. to scroll up and down for multiple choices), or

#2 Each half of a Dual-Function key is assigned to a separate menu. When an operating key or the **DIAL MODE** key is pressed, associated function key menu selections appear at the bottom of the screen. These menu selections may be single choice that require pressing the key once, or multiple choice that require pressing the key repeatedly to make selections.

In certain instances when a function key is pressed, a new set of sub-menu selections appears at the bottom of the screen. This is done to ac-

commodate the number and type of choices associated with the particular operating key.

Operating Keys

There are 16 operating keys that are used to access the functions of the T-STAR, arranged into 4 functionally-related groups. and 22 dial function keys, identified as follows:

SET-UP (6 keys)

MODE
LOOP LBO
EVENT LOGGING
TIME DATE
PRINTER
REMOTE CONTROL

MONITOR (3 Keys)

LINE
ERRORS
PCM CHANNEL

TEST(3 Keys)

LINE
BER
DROP/INSERT

Special Purpose (4 green keys)

PRINT SCREEN
RESULTS SUMMARY
DISPLAY HOLD
RESTART

DIAL (22 keys)

DIAL MODE
SEND
DEL
RCL/STORE
PAUSE
KP
ST/A, STP/B, STP2/C, STP3/D
12-button telephone keypad

T-STAR 2000 TEST and MONITOR Keys

LINE
activate E1 frequency, level, and clock/frame slip measurement functions.
ERRORS
Activate BPV, FRM (Frame), and CRC (in ESF) measurement functions.
PCM CHANNEL
Activate VF channel monitoring functions, Dialed Digit Display option, and WINK TIMER option.

E1 LINE
Activate Out-Of-Service E1 line transmission test function.
E1 BER
Activate Out-Of-Service bit error test functions.
DROP/INSERT
Activate VF channel access test functions (Termination or Drop/Insert test modes).

FRONT PANEL CONTROLS & INDICATORS (Cont'd)

The operating keys and associated menu choices, selected by function keys [F1] through [F5], are described below.

SET-UP KEYS

NAME **DESCRIPTION/M**
CHOICES

The SET-UP keys are used to manually set the input/output configuration of the T-STAR to match a particular E1/E1 facility, and to set up special functions. To access a SET-UP function, you must first press any one of the MONITOR or TEST keys. Screen time out after 60 seconds of no activity and returns to MONITOR or TEST function.

MODE

The MODE functions allows you to change the E1 auto or default setups.

[F1] AUTO Toggles On/Off.
When ON , T-Star will attempt to synchronize on the signal present at E Input ar signal is not present, at F Input. Frame format Code will be detected.
When OFF, Framing and Line Code of T-Star and receiver has to be selected manually.

[F1] TERM E1 Input Termination (scroll up/down)

a. TERM (100 ohms - terminate E1 line)
b. DSX-MON (5000 ohms - patch to DSC MON jack)
c. BRIDGE (5000 ohms - patch to bridging test point)
d. D/I-TERM (100 ohms - terminate E1 line in DIM*)
e. D/I-DSXM (5000 ohms - patch to DSX MON in DIM*)
f. D/I-BRDG (3000 ohms - patch to bridging test point in DIM*)

* DIM - drop/insert mode

NAME DESCRIPTION/MENU CHOICES

[F2] CODE Line code (scroll up/down). This function is used to override the auto set-up (AMI or HDB3)

[F3] FFMT - Frame Format (scroll up/down)

a. CAS&C (Channel Associated Signaling with CRC4)
b. CAS (Channel Associated Signaling)
c. CCS (Common Channel Signaling)
d. Common Channel Signaling with CRC4
e. UNFRM (Unframed)

[F4] CLK - Synchronizing clock source for E1 output (scroll up/do

a. INTCLK (internal clock - termination mode only)
b. REFCLK) external reference clock - termination mode only)
c. RECCLK (recovered clock from E1 input)

[F4] SPKR - In PCM Channel and Drop/Insert mode only

[F5] EXIT - Return to MONITOR or TEST screen

[F5] PCM - Optional - Toggles PCM u-Law and A-Law

LOOP/ LBO

LOOP/LBO functions are used to configure the T-STAR transmitter output terminate a E1 line for Out-Of-Service testing. Termination function include E1 line loopback switching, a line buildout (LBO) network to attenuate the output for level coordination, and a E1 output equalizer to compensate for long cable runs between the T-STAR and DSX bay in the central office (CO).

(Also see DC LOOP switch on side panel that provides a DC path through the T-STAR E1 IN/OUT circuits when simplexed current is present on a metallic E1 span under test.)

TERMINATION Mode

[F1] LBK - E1 IN/OUT loopback (scroll up/down)

a. Off
b. Remote (loops E1 line connected to T-STAR)
c. Local (loops T-STAR E1 IN/OUT circuits)

[F2] LLBO - E1 OUT line equalizer and LBO network

LBO Settings
a. 0 dB
b. -6 dB
c. -12 dB

[F5] EXIT - Return to TEST screen

DROP INSERT Mode DS0 Channel Loopbacks

This function is used in the drop/insert mode to loopback a single DS0 voice or data channel (e.g. at a central office DSX bay), so that the channel can be loop tested from a test access point in the far-end local loop circuit.

[F1] E OUT - F IN Toggle to Off or DS0 LOOP to loop F input to Eoutput.

[F2] F-OUT - E IN Toggle to Off or DS0 LOOP to loop E input to Foutput.

Note: DS0 LOOP loopbacks as many DS0 channels as selected, for example: In fractional FE1 BER mode all channels selected will loopback.

EVENT LOGGING

The EVENT LOGGING function records E1 error performance and E1 line or VF channel measurements at the end of selected time periods (ranging from 1 minute to 48 hours in 14 steps) with alarm events recorded and time/date stamped as they occur during the test periods. The timed-tests are repeated until the EVENT LOGGING function is turned off. The type of E1 line or VF measurements logged depends on the particular MONITOR or TEST functions selected at the time EVENT LOGGING is started.

Alternatively, the EVENT LOGGING function can be set to continuously record and time/date stamp E1 bit errors and alarm events as they occur.

EVENT LOGGING test results and alarm events can be stored in memory, reviewed on screen, and transferred to an external printer for a hardcopy record. If a printer is connected to the T-STAR at the start of EVENT LOGGING, test data is printed out as it is reported and is not stored in T-STAR memory file (observe printer on/off message on screen).

When the memory file overflows, the latest reports write over the earliest reports so that the most recent test data is available for review (FIFO - first in/first out memory). If you anticipate a lengthy test and want to capture all of the test date, use an external printer instead of the internal memory file.

[F1] RATE Selects continuous alarm and error logging or timed-test periods.

a. Off
b. error report*
c. 1 min
d. 5 min
e. 15 min
f. 30 min
g. 45 min
h. 1 hr
i. 2 hr
j. 3 hr
k. 4hr
l. 6hr
m. 9 hr
n. 12 hr
o. 24 hr
p. 48 hr

* Continuous reporting of E1 errors and alarm events

[F2] CLEAR
Empties EVENT LOGGING memory files

[F3] ST/FRZ

Turns EVENT LOGGING FUNCTION ON/OFF

a. EVENT log - Frozen* (function off)

b. EVENT log - Started** (timed or continuous test started)

*Previous test results remain stored in memory, unless external printer was used.

**Error counters reset to zero
[F5] SCRL

Activates scroll function

Sub menu functions

[F1] PAGE - Scroll one page at a time (up/down)
[F2] LINE - Scroll one line at a time (up/down)
[F5] EXIT - Return to EVENT LOGGING screen

[F5] EXIT - Return to MONITOR or TEST screen
NOTE: When the printer is off, the contents of Event Logging files are displayed on screen

TIME/DATE

This function is used to set the T-STAR 24-hour clock and calendar.

[F1] HOUR/MONTH Scroll up/down to set hour (01-24) and month (1-12)
[F2] MIN/DAY- Scroll up/down to set minutes (00-59)and days (1-31)
[F3] SEC/YEAR -Scroll up/down to set seconds (1-60) and year (0-99)
[F4] Toggles between DATE and TIME submenu for F1,F2 and F3
[F5] ENTER - Enter new time/date & return to MONITOR/TEST screen
[F5] EXIT - exit to the previous menu without time/date actualization

PRINTER

Activate PRINTER function and set baud rate, word length and parity to match external printer (NOTE: Do NOT turn printer function to ON without a printer/terminal connected.)

NAME **DESCRIPTION/MENU CHOICES**

[F1] ON/F

Turn PRINTER function ON and OFF

[F2] BAUD

Scroll to set BAUD rate

a. 300
b. 600
c. 1200
d. 2400
e. 4800

[F3] BITS

Toggle to set word length to 7 or 8 bits

[F4] PARITY

Scroll to set PARITY*
a. Even
b. Odd *odd or even number of ones in word
c. None

[F5] EXIT

Return to MONITOR or TEST screen

REMOTE CONTROL

This function allows you to control the T-STAR remotely from a DEC, Wyse or equivalent video terminal (Refer to PRINTER NOTE above).

[F1] On/F

Toggle to turn REMOTE CONTROL function ON and OFF

[F2] BAUD

See BAUD under PRINTER

[F3] BITS

See BITS under PRINTER

[F4] PARITY

See PARITY under PRINTER

[F5] Type

Scroll to set type of terminal:
VT52, VE100, VT200, Wyse 85, Wyse 50

[F5] EXIT
Return to MONITOR or TEST screen

MONITOR KEYS

The three MONITOR keys are used to activate the in-service monitoring functions. In the MONITOR mode, the E1 inputs are connected to the E1 line at DSX-1 MON jacks or other types of bridging test points.

When any MONITOR key is pressed to access the MONITOR mode initially, the T-STAR automatically defaults to DSXMON input mode and RECCCLK. To override a MONITOR default setup, press E1 MODE key.

LINE

MONITOR E1 LINE function allows you to measure frequency (Hz) and level (dBdsx* & volts) of incoming E1 signals; and clock and frame slips (F input clock frequency compared against E input clock frequency. Plus (+) or minus (-) sign indicates that F input clock frequency is higher (+) or lower (-) than input clock). A BPV count is displayed to indicate troubles on the line.

[F1] MEAS -Toggle measurement functions

a. Off
b. Frequency (Hz) & Level (dBdsx*)
c. Frequency (Hz) & Voltage (Vp-p)
d. Clock & Frame Slips (+/- from E input reference clock)

*dBdsx is a base-to-peak (b-p) voltage measurement of E1 line pulses, relative to a 2.4-volt b-p pulse (i.e. 0 dBdsx = 2.4 volts base-to-peak)

[F5] Toggles selection of the side E(equipment) or F(facility)

ERRORS

Activates BPV, FRAME and CRC bit error measurement functions (refer to Appendix C). Scroll keys up/down to display each measurement format and BER test lengths.

[F1] BPV - Bipolar violations

a. Errors (BPV error count)
b. Ers (errored seconds)
c. EFS (error free seconds)
d. BER (bit error rate & Auto TL*)
e. TL:E5 (100,000 bits)
f. TL:E6 (1 million bits)
g. TL:E7 (10 million bits)
h. TL:E8 (100 million bits)

*TL - Test Length

[F2] FRM - FAS Bit Errors
a. Errors (framing bit error count)
b. ErS (errored seconds)
c. EFS (error-free seconds)
d. FER (frame bit error rate & AUTO Test length
e. TL: 1K (1 thousand bits)
f. TL: 10K (10 thousand bits)
g. TL: 100K (100 thousand bits)

[F3] CRC - Cyclic Redundancy Check Errors
a. Errors (CRC bit error count)
b. ErS (errored seconds)
c. EFS (error-free seconds)

[F5] Toggles selection of the side E(equipment) or F(facility)

PCM CHANNEL

Activates the VF channel monitoring functions. Screen displays E/ F inputs, channel numbers, and ABCD signaling bit status. This function is also used to access the Wind Timer option and Dialed-Digital Display option (in conjunction with the DIAL MODE key).

[F1] CH-E - Scroll to select E input channel (01-24) or auto scan. to scan activates after scrolling once past channel 24.

[F2] CH-F - Scroll to select F input channel (01-24).

[F3] MEAS - VF frequency & level measurements. Toggle to turn measurement on or off.

[F3] WINK

Refer to Appendix H (Wink Timer Option).

[F4] All - Display incoming ABCD signaling bit status in all nels simultaneously.

[F5]up E - Activate E lead interface at E/M jack. E lead signal from the "A" bit is routed to the E lead of E/M jack.
[F5]dn Toggles selection of the side E(equipment) or F(facility)

TEST KEYS

The three TEST key are used to activate the Out-Of-Service tests. The E1 LINE and E1 BER functions are performed with E1 circuit taken out of service. DROP/INSERT functions are performed with E1 circuit in or out of service. When E1 circuit is In-Service, any channel can be taken out of service and tested without disturbing the other 29 channels.
When the E1 LINE or E1 ERRORS key is pressed to access the TEST mode, the T-STAR defaults to TERM (termination) and INTCLK (internal clock).

If you press the DROP/INSERT key first* to access a circuit in the DROP/INSERT TEST mode, the T-STAR defaults to DSXMON (DSX monitor input mode) and RECCLK. To override a TEST default setup, press E1 MODE key.

*(i.e. before pressing the E1 LINE or E1 ERRORS key).

LINE

TEST E1 LINE function allows you to send CSU or programmable loop up/down signals to far-end loopback switch; emulate CSU loopback switching functions; transmit ALL ONES or QRSS test patterns; and measure the frequency and level of incoming E1 signals, frame & clock slips, and span line current. A BPV count is displayed to alert operator of possible troubles.

[F1] up RAI - Send Remote Alarm Indication signal to far end.

[F1] dn AIS - Send Alarm Indication Signal to far end

[F2] up MFRAI - Send Multiframe Remote Alarm Indication to far end

[F2] dn MFAIS - Send Remote Multiframe Alarm Indication Signal to far end

[F3]up PLS - Pulse Shape Analysis Option,

[F3] dn MEAS - Scroll to activate measure functions

BER

The E1 BER key is used to activate the Out-Of-Service bit error test functions. This includes generating test patterns to test for logic, BPV, FAS and CRC errors if CRC-4 mode is used)

Logic, BPV, FAS and CRC error performance is measured in 4 different formats (errors, errored seconds, error-free seconds, and bit error rate). Also CCITT recommendation G.821 error performance can be measured (severely errored seconds, available seconds, unavailable seconds, degraded minutes, % availability, % severely errored seconds, and % degraded minutes).

[F1] up LGC - Logic errors (requires test pattern).

a. Errors (logic error count)
b. ErS (errored seconds)
c. EFS (error-free seconds)
d. SES (severely errored seconds)*
e. AS (available seconds)*
f. UAS (unavailable seconds)*
g. DMIN (degraded minutes)*
h. %Avail (percent availability)*
i. %SES (percent severely errored seconds)*
j. %DMin (percent degraded minutes)*
k. BER (bit error rate - autoranging test length)
l. TL: E5 (100 thousand bits)
m. TL: E6 (1 million bits)
n. TL: E7 (10 million bits)
o. TL: E8 (100 million bits)

*CCITT G.821 performance measurements

[F1] dn BPV - Bipolar violations

a. Errors (BPV error count)
b. ErS (errored seconds)
c. EFS (error-free seconds)
d. BER (bit error rate - autoranging test length)
e. TL: E5 (100,000 bits)
f. TL: E6 (1 mil bits)
g. TL: E7 (10 mil bits)
h. TL: E8 (100 mil bits)

[F5] dn LpDN - Activate CSU loop DOWN code generator (loop DOWN code times out automatically as selected by user).
Also activate auto CSU loopback switch.

LpDN sub menu functions

[F1] UP/DN - Scroll up/down to program user-defined UP code (any combination of 1's & 0's up to 8 bits)
User-defined codes remain in non-volatile memory until reset or when battery failure occur.

[F2] SEND - UDF - Send user-defined code

[F3] SEND - STD - Send standard code (100)

[F4] AUTO - CSU - Activate auto loopback switch. When key is pressed, CSU: AUTORESPNSE appears on screen. When incoming CSU loop up code (1000) is detected, the T-STAR line loopback switch activates automatically (RCV LOOP UP appears on screen). When incoming CSU loop down code (100) is detected, the loopback switch automatically deactivates (RCV LOOP UP message disappears).

[F5] TMO - Set LpDN code timeout period

TMO sub menu functions

[F1] UP/DN - Scroll up or down to select timeout periods to 5, 7, 10, 12, 14, 15, or 20 seconds.

[F5] EXIT - Return to LpDN screen

[F5] EXIT - Return to E1 LINE screen

a. Frequency/level (dBm) with all ones pattern automatically generated by the transmitter
b. Frequency/level (dBdsx) with the QRSS pattern automatically generated by the transmitter
c. Frequency/voltage (p-p)
d. Frequency/current (mA)
e. Clock/frame slips (+/-)
f. Off

[F4] up LpUP - Activate CSU loop UP code generator (loop UP code turns off automatically when circuit is looped at far end and return signal is detected in E1 IN circuit of T-STAR). Also activate auto CSU loopback switch.

LpUP sub menu functions

[F1] UP/DN - Scroll up/down to program user-defined UP code (any combination of 1's & o's up to 8 bits). User-defined codes remain in non-volatile memory until reset or when battery failure occur.

[F2] SEND - UDF - Send user-defined code

[F3] SEND - STD - Send standard code (1000)

[F4] AUTO - CSU - Activate auto loopback switch. When key is pressed, CSU: AUTORESPNSE appears on screen. When incoming CSU loop up code (1000) is detected, the T-STAR line loopback switch activates automatically (RCV LOOP UP appears on screen). When incoming CSU loop down code (1(UP message disappears).

[F5] EXIT - Return to E1 LINE screen.

[F2] up FRM - Framing bit errors
- a. Errors (framing bit error count)
- b. ErS (errored seconds)
- c. EFS (error-free seconds)
- d. FER (frame bit error rate - autoranging test length)
- e. TL: 1K (1,000 bits)
- f. TL: 10K (10,000 bits)
- g. TL: 100K (100,000 bits)

[F2] dn CRC - CRC errors
- a. Errors (CRC bit error count)
- ErS (errored seconds)
- EFS (error-free seconds)
- d. FER (frame bit error rate - autoranging test length)
- e. TL: 100 bits
- f. TL: 1K (1,000 bits)
- g. TL: 10K (10,000 bits)

[F3] upPTRN - Activates test pattern sub menu function

[F1] QRSS - Quassi-random signal sequence

[F2] FIXED - Fixed patterns (scroll_
- a. 1:1 (10)
- b. 1:3 (1000)
- d. ALL ONES
- e. 1:15 (1 and 15 zeros)
- f. 2 in 8 (01001000)
- h. 1:31 (1 and 31 zeros)

[F3] PRBS - Pseudorandom Bit Sequences
- a. 63 bits
- b. 511 bits
- d. 2E15-1 (32767 bits)
- e. 2E20-1 (1048575 bits

[F4] OFF - turns off pattern generator

[F5] EXIT - Return to E1 BER screen.

[F3] UDPT - Activates from 8 to 32 bytes of user-defined test pattern.
NOTE: User defined patterns are programmed in blocks of 8 bits each using hexadecimal notation (Appendix F)

User-defined test pattern sub menu functions

[F1] UP-DN - Scroll to program hex numbers representing each 8-bit binary pattern to be programmed (up to thirty two 2-digit hex cod are entered successively using the [F2] NEXT key)

[F2] up NEXT - Press to program the next 2-digit hex code

[F2] dn DEL - Scroll to erase the last entry on screen

[F3] up SAVE - Press to store the programmed test pattern displayed on screen (in 1 of 5 memory files).

Save and recall sub menu functions

[F1] 1 - File #1
[F2] 2 - File #2
[F3] 3 - File #3
[F4] 4 - File #4
[F5] 5 - File #5

[F4] dn RECL - Press to recall a stored test pattern (see [F3])

[F5] TX - Press to transmit the user defined pattern displayed on scre

Inject errors sub menu functions

[F2] LGC - Inject logic errors

auto -> a. E-8 (1 error in 100 million bits)
b. E-7 (1 error in 10 million bits)
c. E-6 (1 error in 1 million bits
d. E-5 (1 error in 100 thousand bits)
e. E-4 (1 error in 10 thousand bits)
f. E-3 (1 error in 1 thousand bits)
g. Off

manl -> One error each time [F2] is pressed

[F3] BPV - Inject bipolar logic errors above
manl - one error each time [F3] is pressed

[F4] FRM - Inject frame errors

auto - a. 1:100 (1 error in 100 frame bits)
b. 1:50 (1 error in 50 frame bits)
c. 1:10 (1 error in 10 frame bits)
d. 1:5 (1 error in 5 frame bits)
e. 1:2 (1 error in 2 frame bits)
f. Off

manl - one error each time [F4] is pressed

[F5] EXIT - Return to E1 BER screen

[F4] SYNC - Auto (automatic) or Manl (manual) synchronization.
In Auto mode, the T-Star will attempt to resync automatically after loss of synchronization (INTERRUPTED message will remain on screen until RESTART key is pressed).

In Manl (manual) mode, T-STAR will not attempt to resync until RESTART key is pressed.

[F5] up FE1 - Press to activate the optional Fractional E1 set-up function

Fractional E1 Option Sub Menu Functions

[F1] UP DN CH - Scroll to select DS0 channel number assigned to the fractional E1 circuit. The DS0 channel, also called a timeslot, appears on the screen under the TS:

[F2] up SET - Press to set the selected TS (time slot) number

[F2] dn CLR - Press to erase channel numbers from the screen.
[F3] CLS - Clear the entire edited screen

[F4] ON - OFF - Press to turn FE1 function ON or OFF.
[F5] up EXIT - Press to exit FE1 setup screen and return to E1 BER screen. When FE1 BER tests are completed, press [F5] FE1 to return to FE1 setup screen & turn OFF the FE1 function.

[F5]DN SIDE - Press to select E or F side of E1 Interface

DROP/INSERT

The DROP/INSERT key activates the channel access test mode. Note the E,F or E-Fscreen display.
The default termination is D/I TERM, however, other terminations are available from SET-UP MODE menu, such as:

D/I DSXM
D/I BRGD
or TERM.

In TERM one can access the optional DS0 LOOPBACK E1 SPAN SET-UP function.

The following Screen (applications) are available under termination defined as TERM (left top corner of the screen):

E(or F) Side only Screen - E1 Out-Of-Service

[F1] CH - Scroll up/down to select channel (01-30) or Auto Scan.

NOTE: Scroll once past channel 30 to start Auto SCAN.

[F2] UP Activates E lead interface (open/closed relay contacts) at jack on side panel (tracks incoming signaling "A" bit).

[F2] TX-M - Activates M lead interface (-48 VDC or Ground) at E/M jack on side panel.

[F3] SEND - Scroll to select outgoing VF functions.

a. 404 (404 Hz tone @ 0 dBm)
b. 1004 (1004 Hz tone @ 0 , -.5, -18.0 dBm)
c. 1804 (1804 Hz tone @ 0 dBm)
d. 2804 (2804 Hz tone @ 0 dBm)
e. 2713 (2713 Hz tone @ 0 dBM)
f. Idle (idle code11010101) on selected channel
g. VF IN (activate VF IN jack)
h. TALK (activate microphone)
i. Off (turn off VF send functions)

[F3] MEAS - Scroll to select VF measure functions

a. DS0 - Frequency & level measurements of VF signal (one channel).

b. MEAS - VF measure function OFF.

c. VFIN - Connect side panel VF IN jacks to VF measurement circuits of T-STAR (for external VF signal measurements).

d. MEAS -E(or F) measure function OFF.

NOTICE that if DSP option is installed the combination of 1004,0dBm tone and Measure on will invoke C-message, C-Notch and Signal-to-Noise calculations. See Appendix J for details.

[F4] up UDTx invokes User Defined User submenu to set/reset ABCD bits:

[F1] A=0 Toggles A bit 1/0
[F2] B=0 Toggles B bit 1/0
[F3] C=0 Toggles C bit 1/0
[F4] D=0 Toggles D bit 1/0
[F5] up Exit the submenu
[F5] dn toggles SEND/OFFTx to activate/deactivate inserting of the ABCD bits into theDS0

[F4] dn OFFTx deactivates inserting of the ABCD bits into the DS0

[F5] SIDE toggles between E SIDE Rx - E SIDE Tx screen and F SIDE Tx - F SIDE Rx screen

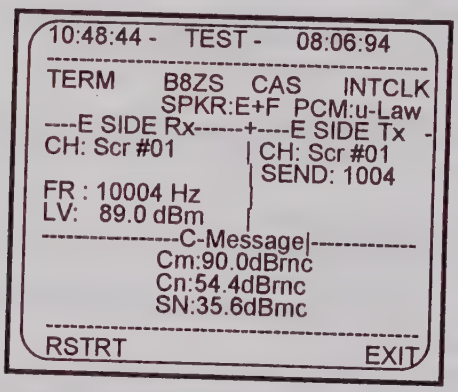
E/F Screens - 2-way DROP/INSERT - E1 In-Service

If the termination selected is D/I TERM, D/I BRGD or D/I DSXM, the DROP/INSERT menu provides many different testing configurations: Depending on the application there are four possible D/I connections for E, F or E&F sides :

The following diagrams show E1 receivers of the T-Star connected to DSX Monitor jacks, which requires D/I DSXM selection on the menu Alternative connection of the receivers to the OUT jacks of the DSX panel requires the D/I TERM selection on the menu.

Screen #1 - Send (Tx) E/Receive (Rx) F

[F1] up CH-E - Scroll up to select Echannel (01-30) or SCAN both E +F *



[F1] dn CH-F - Scroll up to select F channel (01-30) or SCAN both E+F *

Set SPKR to E, F or E+F to listen to selected channel

[F2] up E-ON enables E bit output on the side panel, which will follow the state of the received A-bit of E(equipment) side

[F2] dn Tx-M scroll to activate M-lead interface on the side panel

[F3] up SEND - Scroll to select VF Send functions.

a. 404 (404 Hz tone @ 0 dBm)
b. 1004 (1004 Hz tone @ 0 , -0.5 and -18.0 dBm)
c. 1804(1804 tone @ 0 dBm)
d. 2150 (2150 tone @ 0 dBm)
e. 2804 (2804 Hz tone @ 0 dBm)

f.. 2713 (2713 Hz tone @ 0 dBm)
g. Idle(Idle tone 11010101)
h. VF IN (activate EAST VF IN jack on side panel)
i. TALK (activate built-in microphone)
g. Off

[F3] dn MEAS - Toggle CHN-E/F IN DS0 Freq/Level Measure Function on/off

[F4] up UDTx invokes User Defined User submenu to set/reset ABCD bits:

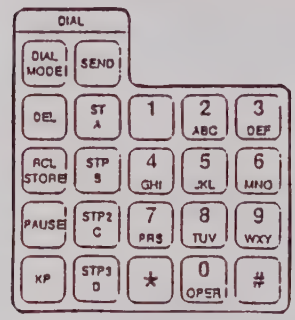
[F1] A=0 Toggles A bit 1/0
[F2] B=0 Toggles B bit 1/0
[F3] C=0 Toggles C bit 1/0
[F4] D=0 Toggles D bit 1/0
[F5] up Exit the submenu
[F5] dn toggles SEND/OFFTx to activate/deactivate inserting of the ABCD bits into theDS0

[F4] dn OFFTx deactivates inserting of the ABCD bits into the DS0

[F5] SIDE scrolls through the following four screens :

E SIDE Rx - E SIDE Tx
E SIDE Tx - F SIDE Rx
E SIDE Rx - F SIDE Tx
F SIDE Rx - F SIDE Tx

DIAL FUNCTION



The DIAL function allows you to send OFF-HOOK signals and dial telephone numbers over any selected channel (in DROP/INSERT mode). The dial keys include 4 function keys, 6 special dial keys, and a standard 12-key telephone keypad.

Also used to activate Dialed-Digit Display option.

Function Keys (Standard Dialing Mode)

DIAL MODE

Activate dial function when T-STAR set to DROP/INSERT mode.

[F1] CH - Scroll up/down to select channel number.

[F2] MODE - Scroll up/down to select signaling mode.

Letter in parenthesis is a symbol identifying the selected dialing mode. It appears on screen in front of the dialed numbers and is useful when two dialing modes are used in the dial sequence (e.g. DTMF/MF equal access dialing).

a. DTMF (T)
b. MF (M)
c. DPAB (a)

[F2] Type - Scroll up/down to select type of dialing

a. Man - Each dialed digit is transmitted as key is pressed.
b. Aut - Dialed number on screen is transmitted each time SEND key is pressed.
c. Rpt - On-hook/off-hook signaling and dialed number on screen are sent repeatedly when SEND key is pressed.

[F3]up TALK - Activate microphone circuit.

[F3] OFF-HK - ON-HK - Toggle outgoing A&B bits to OFF-HOOK or ON-HOOK

Signaling mode functions

[F4] - Toggle to select -ST (standard) or -UD (user defined) on/off hook ABCD bit states for [F3] key.

[F5] UDHK - Activates programmable on/off hook function

[F1] A = Toggle "A bit" to 1 or 0

[F2] B = Toggle "B bit" to 1 or 0

[F3] C = Toggle "C bit" to 1 or 0

[F4] D = Toggle "D bit" to 1 or 0

[F4] OFF-HK - Store off-hook program in memory

[F5] ON-HK - Return to DIAL MODE menu

[F5] EXIT - Store on-hook program in memory

Special Dial Keys

SEND

Transmits dialed number in Auto dial mode and ON/OFF-HOOK signaling and dialed number in Repeat dial mode.

DEL

Deletes the last dialed digit or character displayed on screen each time key is momentarily pressed. When key is held down, the entire number displayed is erased.

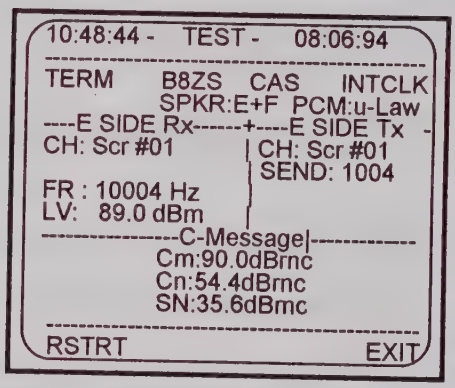
RCL/STORE

Store and recall up to 5 telephone numbers, each up to 69 characters. Press key to switch from Store to Rcl function. Press and hold key to switch from Rcl to Store function. When store or recall function is activated, the message "[PRESS #1 TO #5]" appears at bottom of screen.

The following diagrams show E1 receivers of the T-Star connected to DSX Monitor jacks, which requires D/I DSXM selection on the menu Alternative connection of the receivers to the OUT jacks of the DSX panel requires the D/I TERM selection on the menu.

Screen #1 - Send (Tx) E/Receive (Rx) F

[F1] up CH-E - Scroll up to select Echannel (01-30) or SCAN both E +F *



[F1] dn CH-F - Scroll up to select F channel (01-30) or SCAN both E+F *

Set SPKR to E, F or E+F to listen to selected channel

[F2] up E-ON enables E bit output on the side panel, which will follow the state of the received A-bit of E(equipment) side

[F2] dn Tx-M scroll to activate M-lead interface on the side panel

[F3] up SEND - Scroll to select VF Send functions.

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g. Idle(Idle tone 11010101)
h. VF IN (activate EAST VF IN jack on side panel)
i. TALK (activate built-in microphone)
g. Off

[F3] dn MEAS - Toggle CHN-E/F IN DS0 Freq/Level Measure Function on/off

[F4] up UDTx invokes User Defined User submenu to set/reset ABCD bits:

[F1] A=0 Toggles A bit 1/0
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[F3] C=0 Toggles C bit 1/0
[F4] D=0 Toggles D bit 1/0
[F5] up Exit the submenu
[F5] dn toggles SEND/OFFTx to activate/deactivate inserting of the ABCD bits into theDS0

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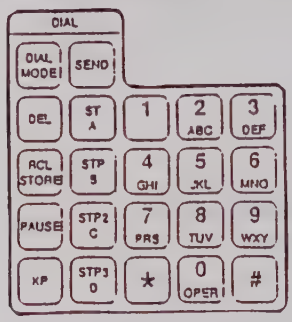
E SIDE Tx - F SIDE Rx
E SIDE Rx - F SIDE Tx
F SIDE Rx - F SIDE Tx

DIAL FUNCTION



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Activate dial function when T-STAR set to DROP/INSERT mode.

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a. DTMF (T)
b. MF (M)
c. DPAB (a)

[F2] Type - Scroll up/down to select type of dialing

a. Man - Each dialed digit is transmitted as key is pressed.
b. Aut - Dialed number on screen is transmitted each time SEND key is pressed.
c. Rpt - On-hook/off-hook signaling and dialed number on screen are sent repeatedly when SEND key is pressed.

[F3]up TALK - Activate microphone circuit.

[F3] OFF-HK - ON-HK - Toggle outgoing A&B bits to OFF-HOOK or ON-HOOK

Signaling mode functions

[F4] - Toggle to select -ST (standard) or -UD (user defined) on/off hook ABCD bit states for [F3] key.

[F5] UDHK - Activates programmable on/off hook function

[F1] A = Toggle "A bit" to 1 or 0

[F2] B = Toggle "B bit" to 1 or 0

[F3] C = Toggle "C bit" to 1 or 0

[F4] D = Toggle "D bit" to 1 or 0

[F4] OFF-HK - Store off-hook program in memory

[F5] ON-HK - Return to DIAL MODE menu

[F5] EXIT - Store on-hook program in memory

Special Dial Keys

SEND

Transmits dialed number in Auto dial mode and ON/OFF-HOOK signaling and dialed number in Repeat dial mode.

DEL

Deletes the last dialed digit or character displayed on screen each time key is momentarily pressed. When key is held down, the entire number displayed is erased.

RCL/STORE

Store and recall up to 5 telephone numbers, each up to 69 characters. Press key to switch from Store to Rcl function. Press and hold key to switch from Rcl to Store function. When store or recall function is activated, the message "[PRESS #1 TO #5]" appears at bottom of screen.

Press number 1, 2, 3, 4, or 5 on telephone keypad to recall a number or to store it in the respective file.

PAUSE

Each time key is pressed, a 1-second pause (".") is inserted into the dialed number sequence (used in AUTO or REPEAT dial modes).

KP

In MF signaling mode sends KP signal ("K")

ST/A

In MF signaling mode sends ST signal ("S"); In DTMF mode sends "A" signal.

STP/B
In MF signaling mode, sends STP signal ("-"); In DTMF mode sends "B" signal.

STP2/C

In MF signaling mode, sends STP2 signal ("="); In DTMF mode sends "C" signal.
STP3/D

In MF signaling mode, sends STP3 signal ("%"); In DTMF mode sends "D" signal.

Function Keys (Dialed-Digit Display Option)

DIAL MODE

Activates DIAL DIGIT DISPLAY option when T-STAR is set to MONITOR DS0 CHANNEL test mode.

[F1] CH - Scroll up/down to select channel number

NOTE: [F3] DPAB/E&M and DS0/VF-IN menu selections are reserved for future use. When implemented, this function will allow users to perform dialed-digit testing on 4-wire analog circuits.

[F4] CLR - Erases dialed digits displayed on screen

[F4] ON/OFF - Toggle to turn function ON and OFF

[F5] MODE - Scroll to select signaling mode

a. DP/A&B
b. MF
c. DTMF/MF (with KP)

SPECIAL KEYS

There are four green-colored keys located on the lower left side of the front panel and a HISTORY RESET key on the right side opposite the function keys. The HISTORY KEY key clears the History LED's on both sides E and F.

PRINT SCREEN

Starts print screen function when PRINTER function is ON and printer is connected to T-STAR. All data on LCD screen, including time and date, is printed out when key is pressed. NOTE: Do not press PRINT SCREEN key without a printer or a terminal connected to the T-STAR.

RESULTS SUMMARY

The RESULTS SUMMARY is a future function to br defined in the next software revision

DISPLAY HOLD

"Freezes" the instantaneous E1 bit error counts appearing on the screen. NOTE: error counting continues, only the display is "frozen".

RESTART

When the RESTART key is pressed, the message "restarting" appears on screen. After a four second delay,(required to synchronize two processors) the E1 bit error , frame/clock slip counters and History LED'se reset to zero (NOTE: there is no delay if test pattern generator is not on). The message "INTERRUPTED" disappears, if displayed.

CHAPTER 3

OPERATING THE T-STAR 2000

GENERAL INFORMATION

This chapter describes how to setup and operate the T-STAR 2000. Before using the instrument, you should understand its functions and capabilities (chapter 1 and 2); the characteristics of the E1/E1 facilities that you are going to test; an the type of test that you wish to perform.

See Figures 2-1 and 2-2 for illustrations of side and front panels.

You can operate the T-STAR 2000 from the internal battery or from a standard AC power outlet with the 115VAC to 15VDC power adapter supplied with the test set. You should use the power adapter when AC power is available to conserve the internal battery.

The internal battery will operate the instrument for about 4 hours (depending on usage) from a full charge. It takes about 8-12 hours to fully recharge the battery. When the battery voltage becomes too low, an audible alarm sounds and a "LOW BATTERY VOLTAGE" message flashes at the top of the screen. You have about 5 minutes more operating time after the warning occur, before the unit will cease operating, unless the AC adapater is plugged in the 14.4.V jack.

Operation of the T-STAR 2000 is relatively easy once you learn its features and functions. For example, it will automatically sense which side E or F is connected to the live signal and configure to the FRAMING FORMAT (CAS&C,CAS,CCS&C,CCS,Unframed) and LINE CODE (AMI/HDB3) of the circuit under test. In addition, many test setups are set automatically when you select the type of test that you wish to perform. Since the T-STAR provides full 2-way drop/insert testing, there is a set of E1 and VF jacks for both directions of transmission. The jacks are labeled E(equipment) and F(facility).

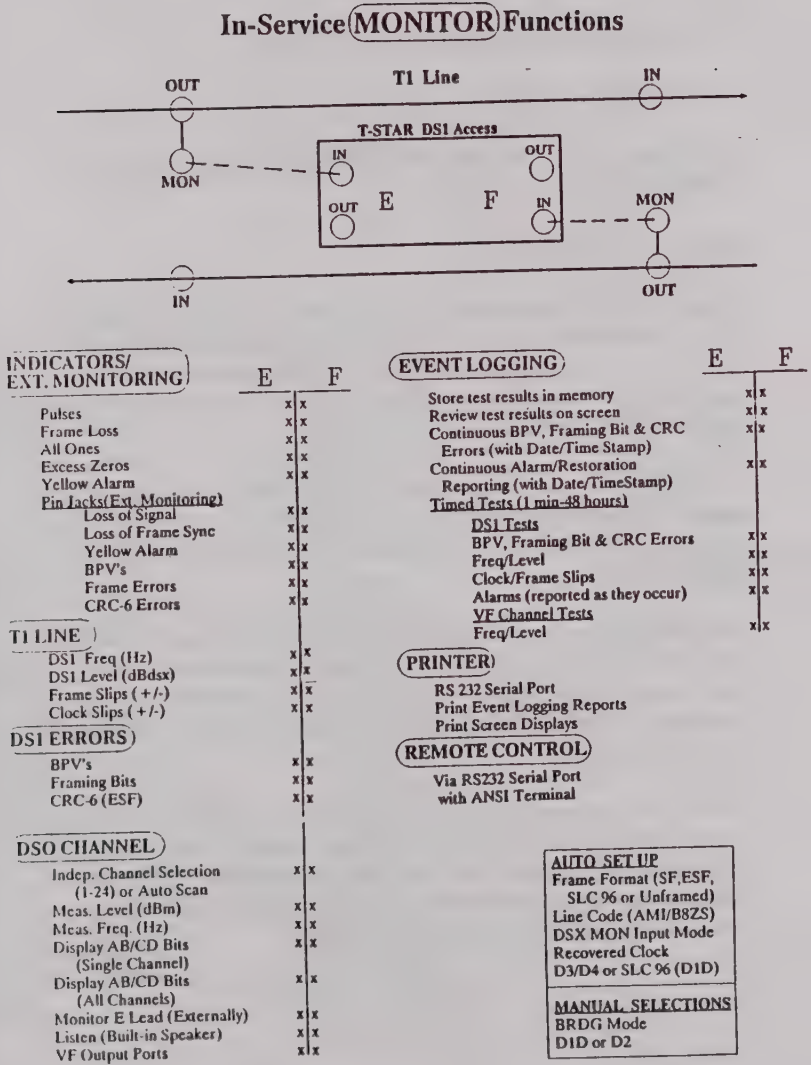


FIGURE 3-1. T-STAR 2000 In-Service MONITOR Functions

FIGURE 3-1. T-STAR 2000 In-Service MONITOR Functions

OPERATING MODES

The T-STAR 2000 operates in THREE MODES

1. MONITOR (E1 In-Service)

2. TEST (E1 Out-Of-Service)

3. DROP/INSERT (E1 In-Service, with any VF channel taken Out-Of-Service for testing)

MONITOR (Figure 3-1)

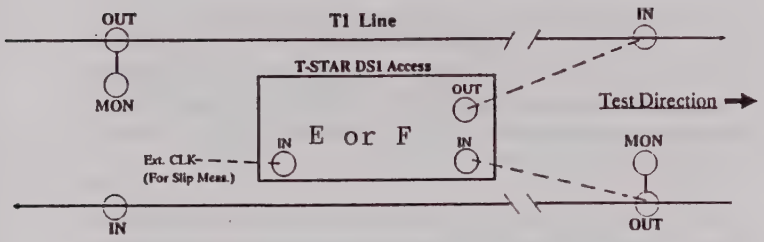
In the MONITOR mode, the T-STAR is connected to the circuit under test in a non-intrusive manner. This is done by connecting patch cables from the E1 IN jacks to monitoring or bridging test points on the transmit and receive sides of the circuit under test, and then pressing one of the MONITOR keys.

The T-STAR automatically defaults to the DSX-MON input mode (i.e. for use at a DSX-1 patch bay or CSU MONITOR jack). At a DSX-1 test point, the E1 signal is at its optimum level of 0 dBdsx (3-volts, base-to-peak).

The BRIDGE input mode must be selected manually (using E1 MODE SET-UP key) if the T-STAR is to be connected to the line at a point other than a DSX-1 (or equivalent) test jack. NOTE: In BRIDGE mode, the T-STAR auto gain control circuit also will automatically adjust to the input signal level.

NOTE: You can monitor LOGIC errors (pattern or bit errors) on a E1 system that has been taken out of service for testing. With a test pattern inserted at one end of the circuit, you can bridge onto the line at intermediate points (e.g. span repeater sites) and measure LOGIC error performance using the TEST E1 BER function.

Out-of-Service (TEST) Functions



LINE
- Send CSU Loop Up/Down Codes
- Emulate CSU loopback
- DS1 Freq. (Hz)
- DS1 Level (dBdsx or dBm)
- Span Line Current (mA)
- Frame Slips (+/-)
- Clock Slips (+/-)
- Generate QRSS/All Ones
- Generate Yellow Alarm

S1 BER
- Meas. BPV's, Framing Bits & CRC-6
- Meas. Logic Errors/G.821
- Generate Test Patterns
- Inject Errors

ROP/INSERT
- Manual Channel Selection or Auto Scan
- Control Tx AB/CD Bits
- Monitor Rx AB/CD Bits
- M Lead Control (Externally)
- E Lead Monitor (Externally)
- Send Tones (404, 1004, 2804, 2713 Hz)
- Meas. Rx Ch. Freq/Level (dBm)
- Listen on Channel
- VF IN/OUT Access Ports

AL ODE
- Talk & Listen on Channel
- DTMF, MF Dial Pulse
- Manual, Auto & Repeat Dialing
- Telephone Keypad with Mic. & Speaker
- Store 5 Numbers

T1 SPAN
- LBO (0, -7.5 or -15 dB)
- DSX Cable Equalization (0-655 feet)
- Span Line DC Loop (side panel switch)
- T1 Circuit Loopback

INDICATORS
- Pulses
- Frame Sync Loss
- All 1's
- Excess 0's
- Yellow Alarm
- Test Pattern Sync

EVENT LOGGING
- Store test results in memory
- Review test results on screen
- Continuous Logic, BPV, Framing Bit & CRC Errors (with Date/Time Stamp)
- Continuous Alarm/Restoration Reporting (with Date/Time Stamp)
- Timed Tests (1 min-48 hours)
  - DS1 Tests
    - Logic, BPV, Framing Bit & CRC Errors
    - Freq/Level
    - Clock/Frame Slips
    - Alarms (reported as they occur)
  - VF Channel Tests
    - Freq/Level

PRINTER
- RS 232 Serial Port
- Print Event Logging Reports
- Print Screen Displays

REMOTE CONTROL
- Via RS232 Serial Port with ANSI Terminal

AUTO SET UP
- Frame Format (SF,ESF, SLC 96 or Unframed)
- Line Code (AMI/B8ZS)
- TERM Mode
- Internal Clock
- D3/D4 or SLC 96 (D1D)

MANUAL SELECTIONS
- D/I-TERM Mode
- Recovered or Ref. Clock
- D1D or D2

Figure 3-2. T-STAR 2000 Out-of-Service TEST functions

TEST (Figure 3-2)

In the TEST mode, the T-STAR terminates both sides of a E1 circuit.

To correctly terminate the E1 facility, a cable is patched from the T-STAR E1 OUT jack (E) to the IN jack (transmit side) of the circuit. A second cable is patched from the E1 IN jack (E) to the OUT jack (receive side) of the circuit. The E1 LINE TEST key is then pressed to activate the auto setup features (TERM input mode, INTCLK, fram format and line code of the test circuit).

In the out-of-service test mode, all of the T-STAR VF channel access, signaling, dialing and transmission tests can be performed using the DROP/INSERT functions.

The T-STAR 2000 is equipped with standard Network Interface features, including line buildout (LBO), simplex power loop, and DB-15/RJ48C connectors.

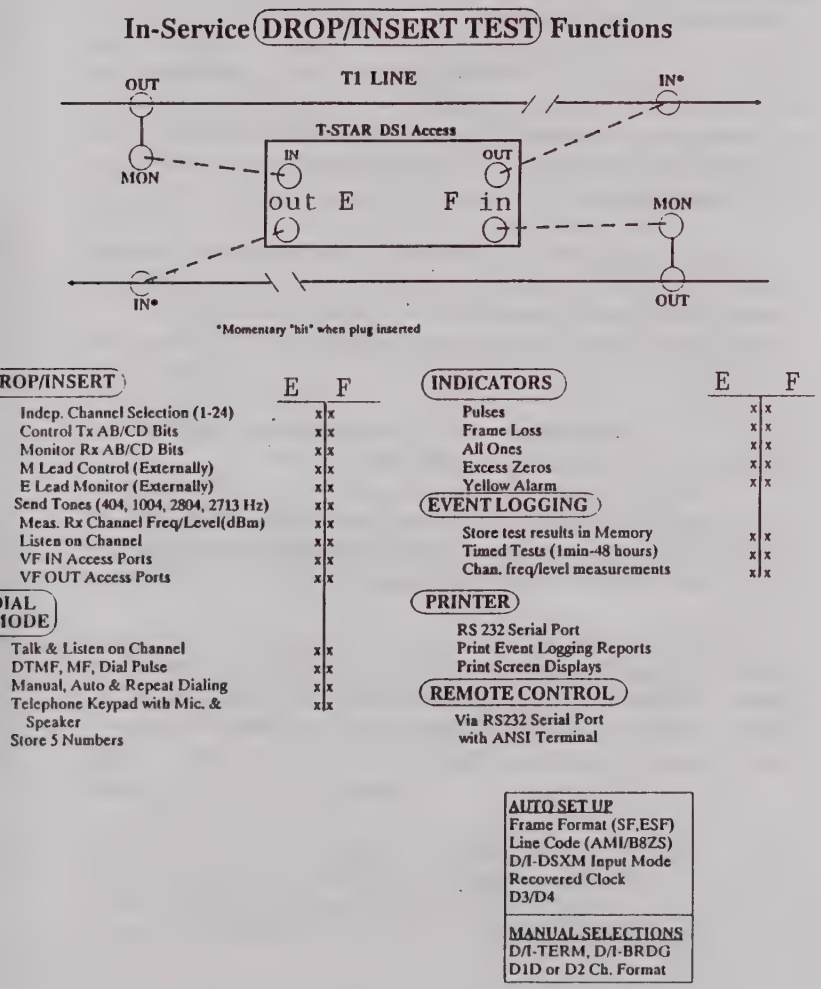


Figure 3-3. T-STAR 2000 (E1 In-Service) DROP/INSERT TEST Functions

DROP/INSERT TEST (Figure 3-3)

In this mode, a single VF channel can be taken out of service for troubleshooting and testing, without disturbing the other 23 channels. Also, a single DS0 channel (VF or digital) can be looped back towards its origin (in both directions) when the optional DS0 CHANNEL LOOPBACK option is installed.

To access a circuit in a DROP/INSERT mode, a cable is patched from the T-STAR E1 IN jacks to a MONITOR or BRIDGING jacks on the E1 circuit. The DROP/INSERT key is then pressed to activate the DROP/INSERT function (the T-STAR automatically sets to the D/I DSXM input mode).

When frame synchronization is achieved (FR LOSS lamp off), cables are patched from the T-STAR E/W E1 OUT jacks to the IN jacks of the circuit (this may cause a momentary "hit" but should not cause and alarm). The E1 line signals are now passing through the T-STAR undisturbed.

Insert 100 ohm terminating plugs in the corresponding OUT jacks to terminate the E1 line in the correct matching impedance.

This completes the set up. All of the channels now pass through the T-STAR and can be monitored, one at a time, without being disturbed. Any selected channel remains undisturbed until a SEND function is activated.

The T-STAR 2000is equipped with signaling, dialing, speakers, microphones, telephone key pad, test tones, level/frequency measuring, VF IN/OUT and E/M jack facilities for complete 2-way channel access testing.

INITIAL PREPARATION AND SETUP

SUMMARY

Turn on the T-STAR and check to see that is passes the Self Test. Also check to see that the battery is charged and ready for use. If needed, re-charge the battery for a period of 12 hours.

Decide what type off test that you are going to perform (MONITOR, Out-Of-Service TEST, or DROP/INSERT with E1 In-Service), connect T-STAR to the E1 line, and the PRESS the appropriate TEST or MONITOR key. Note that the input mode, line code and frame format initially appear on screen in lower case letters and then switch to upper case when the incoming signal is properly detected.

There are six SET-UP keys that are used to activate the setup functions. The MODE key is used only when necessary to override the automatic interface setups. The TIME DATE key is used to set the T-STAR clock and calendar.

The LOOP/LBO key is used when necessary to setup line loopback, LBO, and cable equalization functions (i.e. to match line and test conditions) for Out-Of-Service testing and to setup the optional DS0 channel loopback function in the Drop/Insert test mode.

The other three setup keys, labeled EVENT LOGGING, PRINTER and REMOTE CONTROL are used to set up special functions of the T-STAR.

NOTE: The SET-UP screens automatically time out after 60 seconds of no activity (i.e. no key pressed).

To activate the SET-UP functions, you must connect the T-STAR to the E1 line (according to the type of test that you are going to perform) and then PRESS the associated MONITOR or TEST key. In most test situations you will NOT need to use the SET-UP keys during initial setup.

INITIAL START UP

STEP PROCEDURES	COMMENTS
1. Turn power switch to ON and patch T-STAR to E1 circuit under test.	Use AC power, when convenient, to conserve battery
2. PRESS any MONITOR or TEST key according to type of test mode you have selected.	Observe auto setups at top of screen
NOTE: T-STAR cannot be operated if FRAME FORMAT and/or LINE CODE are not detected and T-STAR remains in AUTO mode (if necessary you can override the auto mode by pressing E1 MODE key and reset manually).	

RESET CLOCK & CALENDAR

1. Press TIME DATE key.	TIME DATE screen appears
2. Scroll [F1] thru [F5] to select current time and date.	New entries appear on TIME DATE screen
3. Press [F5] ENTER	New time and date appear at top of screen

E1 MODE SETUPS

1. Press E1 MODE key.	You can reset to AUTO (auto-configuration);or manually setup the input mode; line code; frame format; clock source (in termination mode only).
2. Press [F1] AUTO to reset T-STAR autoconfiguration to ON.	See message at bottom of screen. Also see Line Code&Frame Format at top of screen. When T-STAR detects

STEP	PROCEDURES	COMMENTS
3.	Scroll [F1] TERM to manually select input mode.	DSX-MON and BRIDGE are the only choices available in the MONITOR mode (Refer to Appendix D).
4.	Scroll [F2] CODE to manually select line code of incoming signal.	T-STAR autoconfigures to AMI or HDB3.
5.	Scroll [F3] FFMT to manually select framing format of incoming signal.	T-STAR autoconfigures to framed and unframed format. Framing format without signaling must be set manually.
6.	Scroll [F4] CLK to select source of synchronizing clock for T-STAR.	Applicable ONLY when T-STAR input is set to TERM mode. In MONITOR, BRIDGE or DROP/INSERT mode the T-STAR automatically sets to RECCLK (recovered clock).
7.	Press [F5] EXIT to return to MONITOR or TEST function.	

STEP	PROCEDURES	COMMENTS

E1 SPAN SETUPS

Out-Of-Service TEST mode

1. Press E1 SPAN key.	You can now select the line loopback, LBO, or cable equalization setups needed for circuit under test.
2. Scroll [F1] LBK and/or [F3] W-LBK keys to select remote or local loopback.	Local loopback loops the internal E1 IN/OUT circuits of the T-STAR. Remote loopback loops the E1 circuit connected to E1 IN/OUT jack.
3 Scroll [F2] LLBO to select E E1 OUT cable equalization or LBO (line buildout).	Set equalization to match cable length from test point to DSX bay. Or, set LBO if necessary to attenuate E1 output of T-STAR for E1 circuit level coordination.
4. Press [F5] to EXIT setup function and return to TEST screen.	
5. If necessary set the DC LOOP switch on the side panel to the closed (CL) position.	This provides a DC path for simplex span power if present on the E1 line.
1. Press E1 SPAN Key.	Optional DS0 channel loopback screen appears.
2.Toggle [F1] E-OUT/F-IN to off or to DS0 LOOP to loop F input to E output.	
3. Toggle [F2] F-OUT/E-IN to off or to DS0 LOOP to loop E input to F output.	

PERFORMING TESTS

Performing test is easy, after the test mode (i.e. type of test) has been selected, the T-STAR is correctly patched to the E1 circuit under test, a MONITOR or TEST function has been selected, and no alarm conditions are displayed on the front panel LED indicators.

The T-STAR operates in the following three E1 interface test modes:

1. In-Service E1 and VF Channel Monitoring.
2. Out-Of-Service E1 and VF Channel Testing.
3. Drop/Insert Channel Testing (E1 In-Service)

Following are examples of the operating procedures required to monitor and test E1 circuits and VF channels using the T-STAR 2000. The procedures are arranged according to the three test modes listed above.

NOTE: You should read and understand descriptive information in Chapter 2 of this manual before attempting to operate the T-STAR

IN-SERVICE E1/E1 & VF CHANNEL MONITORING

STEP PROCEDURES	COMMENTS
SETUP	
1. Turn ON T-STAR and patch test cable from E1 IN E/W jacks to E1 circuit DSX MON jacks or bridging test points.	E/F PULSES lamps should be ON.
2. Press E1 LINE key under MONITOR.	T-STAR defaults to DSX MON with RECCLK & auto-configures to FRAME FORMAT and to LINE CODE of E1 circuit.
NOTE: If FR LOSS lamps remain ON, press E1 MODE and then [F1] AUTO. If necessary, manually scroll [F3] FFMT to achieve synchronization.	Press E1 MODE key to change DSX MON to BRIDGE or to change frame format. FR LOSS lamps should be OFF.

E1 LINE MEASUREMENTS

STEP	PROCEDURES	COMMENTS
1.	Scroll [F1] MEAS to display frequency, level, voltage and measurements.	E1 E input only for frequency & slip level measurements. E/F inputs are compared for slip measurements (E is reference, e.g. a "+" signs means that the F input frequency is higher than the E input)
	Typical Frequency/Level Values:	
	Freq: 2048000 +/- 80 Hz.	
	Level: -3 to -4 dBdsx +	At DSX MON jacks. and DSX level BRIDGING test points.
	Volts: +3 to +4 p-p	At DSX MON jacks. and DSX level BRIDGING test points.
2.	To record E1 LINE test results at selected time intervals press EVENT LOGGING key.	

MONITORING E1 ERRORS

1.	Press E1 ERRORS key under MONITOR.	
2.	Scroll [F1] BPV, [F2] FRM or [F3] CRC (in ESF) to display other error formats, including TEST LENGTH (TL).	E side only. Refer to Appendix C.
3.	Press RESTART key to reset counter to zero.	
4.	To record E1 ERRORS test result, press EVENT LOGGING key.	Refer to page __ for instructions.

MONITORING DS0 CHANNELS

STEP	PROCEDURES	COMMENTS
1.	Press DS0 CHANNEL key under MONITOR.	Rx signaling status displayed.
2.	Scroll [F1] CH E to select E channel or to scan E & F channels automatically.	Scroll once past channel 24 to set scan mode. To stop scanning press [F1] key.
3.	Scroll [F2] CH F to select F input channel.	If E1 circuit is connected to F IN jack.
4.	Scroll [F3] MEAS to DS0 (E input), DS0 (F input) or to turn OFF measure function.	Frequency/Level measurements in the DS0 channel are displayed on screen.
5.	Press [F3] WINK (if optional Wink Timer function is installed).	Activates Wink Timer. Refer to Appendix H.
6.	Press [F4] ALL to display signaling bit status in all channels, then press [F5] key to EXIT.	Displays status in all 24 channel simultaneously (E & F).
7.	Turn up speaker volume to listen selected channel.	E, F or E & F (optional)
8.	To record VF measurements at selected time intervals, press EVENT LOGGING key.	Only the VF measurement functions displayed on screen will be recorded (in addition to the E1 BER and alarm functions).
9.	Press DIAL MODE key to activate the Dial Digit Display option.	Refer to Appendix F.

OUT-OF-SERVICE E1 & VF CHANNEL TESTING SETUP

STEP	PROCEDURES	COMMENTS
1.	Turn on T-STAR and patch test cable from E1 OUT (EAST) jack to IN jack at DSX level test point. Patch a second cable from the E1 IN (E) jack of T-STAR to OUT jack (receive side of circuit under test).	If terminating a metallic E1 span with simplex current present on the line, set the DC LOOP switch on side panel to CL (closed) position. You can also connect the T-STAR to the line using the DB-15 or RJ-48 connector.
	NOTE: E1 line must be looped at the far end for 2-way E1 LINE and E1 BER tests. For VF channel tests, the E1 line must be looped at the far end or terminated with digital switch, PBX, or channel bank.	
2.	Press E1 LINE key under test. If necessary, press E1 SPAN SET-UP key and set the LBO or the DSX-1 interconnect line equalization according to your system specifications (using [F2] LLBO key). Press [F5] to EXIT.	T-STAR automatically set to TERM input mode, INTCLK, and ALL ONES test pattern.

Operating Far End CSU Line Loopback Switch

1.	Press [F5] LpUP to start loop up de generator function, then press [F3] SEND STD to send standard CSU UP code. Press [F5] key to EXIT.	Activates CSU loop switch at far end to loop circuit for testing. Code turns off when return signal is detected (E PULSES, ALL ONES & PTTRN Sync lamps ON).
	NOTE: Use ALL ONES test pattern to establish synchronization.	
2.	Press [F5] LpDn to start loop down code generator function, then press [F3] SEND STD to send standard CSU DOWN code. Press [F5] key to EXIT.	Deactivates loop switch at far end. Code appears on screen and then times out automatically. (E indicator lamps go OFF).

Operating Far End Network Interface or SMART jack

STEP	PROCEDURES	COMMENTS
	Loopback Switch	
1.	To set user-defined UP code, scroll [F1] UP/DN until correct code appears on screen.	Code remains in non-volatile memory until changed
2.	Press [F2] UDF SEND to send user-defined UP code.	Code turns ON when return signal is detected (EAST PULSES, ALL ONES & PTRN SYNC LEDs ON)
3.	Press [F5] to EXIT	
4.	To set user-defined DOWN code, scroll [F1] UP/DN until correct code appears on screen.	
5.	Press [F2] UDF SEND to send user-defined DOWN code.	Code appears on screen and then times out automatically(E LED goes off)
6.	Press [F5] to EXIT	
	Setting the LpDn (Loop Down) timeout period	
1.	Press [F5] LpDn then press [F5] TMO	Notation "TIME OUT IN X SEC appears on screen
2.	Scroll [F1] UP/DN to select LpDn timeout period of 5, 7, 10, 12, 14, 15 or 20 seconds.	Setting appears on screen
3.	Press [F5] EXIT to return to LpDn screen.	Selected period remains in memory until changed manually.

Activating the T-STAR Automatic CSU LIne Loopback functions

1. To activate AUTO CSU function, press [F5] LpDN or LpUP and then press [F4] AUTO CSU ("CSU: AUTORESPNSE" message appears on screen).

E1 LINE TESTS

STEP	PROCEDURES	COMMENTS
1.	E1 LINE function key activated in STEP 2 of SETUP procedures	PTTRN SYNC, PULSES and ALL ONES (if pattern set to All Ones) indicator lamps should be ON. FR LOSS lamps should be OFF.
2.	To change test pattern selection from ALL ONES to QRSS, toggle [F2] PTRN key.	QRSS appears in upper left side of screen.

TRANSMISSION TESTS

		Typical MeasurementsFreq:
3.	Scroll [F3] MEAS to display:	2048000 +/- 80 Hz
	a. Frequency & Level (dBm)*	Level: 0 dBdsx +/- 2 dB
	b. Frequency & Level (dBdsx)	+ 16.5 dBm +/- 2 dB
	c. Frequency & Volts (p-p)**	Voltage:+ 7.55 to + 4.76 V/p-p
	d. Frequency & Current (mA)**	Current: 60 or 140 mA
	e. Clock & Frame Slips (+/-)	**at DSX OUT jacks
	*Requires ALL ONES signal	
4.	If desired, press EVENT LOGGING key to activate function and record selected E1 LINE test data results at selected time intervals.	Tests recorded depend on which MEAS (measure) function are currently selected) on screen) when function is set.

Drop/Insert TEST mode (if DS0 Channel Loopback is installed)

Alarm Tests

1. Toggle **[F1] up or dn** to transmit RAI or AIS alarms or **[F2] up or dn** alarms to test conditioning process of far end E1facilities.	Corresponding message will appear on the top left part of the screen. Th e remote end should display the corresponding alarm condition.

E1 BER TESTS

STEP	PROCEDURES	COMMENTS
1.	Press E1 BER key under TEST.	The T-STAR logs test results in the following 4 modes:
	NOTE: To MONITOR logic errors, press E1 MODE key, set input to MONITOR or BRIDGE mode. Press [F5] EXIT to return to E1 BER screen.	a. BER performance only b. BER performance plus E1 Frequency & Level c. BER performance plus E1 Frame & Clock Slips
2.	Press [F3] PTRN and then press scroll [F1] QRSS, [F2] FIXED, [F3] PRBS, or [F3] UDTP (user defined test pattern) to select desired test pattern.	d. BER performance plus VF Frequency & Level.
	NOTE: See below for UDTP.	
3.	Toggle [F4] SYNC to Auto or Manual mode. If sync is inter rupted in Manual mode, you will need to press RESTART key to continue testing.	Press TIME DATE key to cor-rect time and date.
4.	Scroll [F1] & [F2] to display other LOGIC, BPV, FRAME & CRC (ESF) error formats (Refer to Appendix C).	"E" or "E+W" appears on screen (Not applicable in TERM mode). NOTE: Do not set E+W unless both E and F E1 inputs are patched to E1 circuit.
5.	Press [F4] INJ and then scroll or press [F2] LGC, [F3] BPV, and [F4] FRM.	
6.	Press [F5] FE1 to activate the Fractional E1 option if installed.	
7.	Press EVENT LOGGING key to activate logging function.	

USER DEFINE TEST PATTERNS

STEP	PROCEDURES	COMMENTS
1.	Press [F3] UDTP to activate the user-defined test pattern setup screen.	USER-PTRN screen appears.

NOTE: User-defined test patterns are programmed using HEXADECIMAL coding. Each single hexadecimal number/letter represents 4 binary digits. User-define patterns consist of multiples of 8 bits (8, 16, 24 or 32)

2. Scroll [F1] UP/DN to select the 1st and 2nd Hex codes that represent the first 8-bit segment of the test pattern.
3. Press [F2] NEXT to program the next series of 8 bits.

Binary Code to Hexadecimal Code Conversion Chart

BINARY	HEXADECIMAL	BINARY	HEXADECIMAL
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	111	F

4. When necessary, scroll [F2] DEL to erase, the 4th, 3rd, and 2nd hex codes.
5. Press [F3] SAVE to activate memory.
   Press [F1] 1 - [F5] 5 to store test pattern in 1 of 5 memory files.
6. Press [F3] RECL to recall a test pattern from a memory file.
Press [F1] 1 thru [F5] 5 to select the desired memory file number.

VF CHANNELTESTS

DROP/INSERT CHANNEL TESTING

STEP	PROCEDURES	COMMENTS
	SETUP	
1.	Turn T-STAR and patch test cables from E1 IN jacks (E & F) to DSX MON or Bridging jacks of E1 circuit under test.	Refer to Appendix D.
2.	Press DROP/INSERT key under TEST and wait for T-STAR to synchronize with framing format of incoming signals.	Test set autoconfigures to D/I DSXM, RECCLK, & D3/D4 channel numbering format
3.	Connect patch cables to E1 (E and/or F) jacks of T-STAR OUT IN jacks of E1 circuit under test (do this quickly; it may cause a momentary "hit", but should not cause an alarm).	If 2-way testing is to be done in only one SEND direction, you do not need to patch a cable to the IN jack in the opposite send direction
4.	Insert a 100 ohm terminating plug into OUT jack of E1 line (on side where IN jacks were patched).	This terminates the E1 line in it correct impedance.

NOTE: In DROP/INSERT patching arrangement, the E1 line signals initially pass through the T-Star without interruption.

5.	Press E1 SPAN key to activate DS0 Channel Loopback Option if installed.	Refer to Appendix 1.
6.	Scroll DROP/INSERT key to select screen [1] Tx F/Measure E [2] Tx E/MEASURE F [3] E&M test functions (activate E&M jacks).	Observe E and F screen position of TX AB/DC bit status to determine SEND direction.

NOTE: There is only one screen in OUT-OF-SERVICE TEST mode.

CHANNEL SELECTION

STEP	PROCEDURES	COMMENTS
1.	Scroll [F1] CH-E to select E channel (01-24). NOTE: Channel is NOT interrupted until SEND function is activated.	Channel number and incoming AB/CD bit status displayed on screen (E &F)
2.	Scroll [F2] CH-F to select F channel.	

NOTE: DROP/INSERT or VF channel test functions apply to both IN-SERVICE and OUT-OF-SERVICE test modes. The basic differences are in the test setup and the patching arrangements used to connect the T-STAR to the E1 circuit under test.

In the OUT-OF-SERVICE mode, the test setup remains as described on page____ with patch cables connected only to the E and /or F side E1 IN and OUT jacks of the T-STAR.

Refer to DROP/INSERT testing (E1 In Service) beginning on page ____ for channel access VF test procedures used in OUT-OF SERVICE TEST MODE.

CHANNEL SIGNALING & SUPERVISION

The T-STAR provides outgoing signaling supervision for channel units (such as E&M), and a DIALing function. You can test the signaling functions in any selected channel and hold the channel for transmission testing. If you are testing a dial-up channel towards a switch, you need to select the channel, send off-hook supervision and then dial a test number to access the channel in both directions (Refer to DIAL MODE). Control of outgoing signaling bits for both CAS and CAS&C type channel units is available from the DROP/INSERT and the DIAL screen.

STEP	PROCEDURES	COMMENTS
1.	For E&M supervision, toggle [F1] TX-A and [F2] TX-B to 1 (off-hook) or to 0 (on hook).	
2.	To activate E&M leads, toggle [F5] TX-M for M lead, [F5] E for lead.	E
3.	To program all 4 signaling bits independently, press [F4] UDTx (user defined transmit) and then toggle [F1] thru [F4] to set ABCDbits. Press [F5]dn SEND to transmit signaling bits, and press [F5]up EXITto return to DROP/INSERT menu.	

SEND FUNCTIONS

1.	Scroll [F3] SEND to select VF IN, IDLE*, TALK or VF tones(404, 1004, 1804,2150,2804, or 2713 Hz at 0dBmand 1004 at -.5 and 18.0 dBm).	VF IN selsction activates th e VF IN jacks on side panel. TALK activates the microphone.

*TERM input mode only; E only screen.

2. Scroll [F3] SEND again to turn OFF SEND function.

RECEIVE/MEASURE FUNCTIONS

STEP	PROCEDURES	COMMENTS
1.	Turn up volume to listen on channel (side panel knob).	Set speaker to E ,F or E & F.
2.	Scroll [F3] MEAS to turn on DS0 measure, VF IN (external input) and return to MEAS (function OFF).	Frequency and Level Neasurements appear on screen

Note: In Out-of-Service TERM mode , you can set MEAS function to VF-IN to measure external signals connected to VF IN jack.

NOTE: In Out-Of-Service TERM mode, you can set MEAS function to VF-IN to measure external signals connected to VF IN j

DIAL FUNCTION

STEP	PROCEDURES	COMMENTS
1.	Press DIAL MODE key.	You must be in DROP/INSERT test mode to activate DIAL MODE
2.	Scroll [F1] CH to select channel (01-30).	Channel number selected is displayed on screen.
3.	Scroll [F2] MODE to select DTMF, MF,or DPAB signaling mode.	Signaling mode selected is displayed on screen.
4.	Scroll [F2] TYPE to SELECT Man (manual), Aut (auto), or Rpt (repeat) dialing.	Type of dialing selected is displayed on screen.
5.	For standard ON-HK (ABCD =0) or OFF-HK (ABCD = 1) supervision, toggle [F4]<- to ST. Then toggle [F3] to signal OFF-HK.	Listen for dial tone and then dial test number.
6.	To program [F3] ON-HK/OFF-HK function to match other sig naling protocols, press [F5] UDHK. Toggle [F1] thru [F4] to set ABCD OFF-HK protocol (any combina tion of 1's and 0's). Then press [F4] OFF-HK to save setup.	
	Toggle [F1] thru [F4] to set ABCD ON-HK protocol (any combination of 1's and 0's). Then press [F5] ON-HK to save setup.	
	Press [F5] EXIT and then toggle [F4] - to UD.	User-defined ON/OFF HOOK protocol is activated

DIALING INSTRUCTIONS

1. Using telephone keypad, enter telephone number.

   If Auto or Repeat dialing was selected, press SEND key to transmit telephone number displayed on screen.

2. Press [F3] TALK to activate microphone (after dialing is completed).

Number displayed on screen

You can enter a complex dialing sequence (DTMF &MF with pauses). In Repeat dialing, IN-HK/OFF - HK and dialed # are sent repeatedly. To stop repeating, change the type of dialing or EXIT.

STORING &RECALLING NUMBERS

1. To store a number in memory, enter number and then press and hold RCK STORE key until STR appears on screen. To store in file press a number key (1, 2 ,3 , 4 or 5)

2. To recall a number from mem ory press RCL STORE key until RCL appears and selects file # 1 - #5.

To send recalled number displayed on screen , press SEND key. Press [F5] EXIT to return to DROP/INSERT screen

Message [PRESS #1 to #5] appears on screen. There are 5 memory files. Each file can store a number with up to 69 characters

Message [PRESS #1 to #5] appears on screen. There are 5 memory files. When file is selected, number appears on screen.

SPECIAL FUNCTIONS

PRINTER

STEP	PROCEDURES	COMMENTS
1.	Press PRINTER key.	Printer window appears on screen
2.	Scroll [F2] BAUD, [F3] BITS, & [F4] PARITY to set T-STAR setup to agree with external printer.	
3.	Connect external printer to RS232 connector and turn it on.	
4.	Press [F1] ON/F to ON.	Test results stored in memory will "dump" to the printer
5.	Press PRINT SCREEN any tim to print screen displays (including time/date).	Do not press [F1] ON until a printer is connected

REMOTE CONTROL

1. Refer to Appendix E for Remote Control operating instructions.

EVENT LOGGING

STEP	PROCEDURES	COMMENTS
1.	BER Performance Only; Press E1 ERRORS or E1 BER key.	The T-STAR logs test results in the following 4 modes:
	BER PLUS E1 Frequency & Level*; Press appropriate E1 LINE key and select Frequency and Level MEASurment function.	a. BER performance only b. BER performance plus E1 Frequency & Level
	BER Plus Frame & Clock Slips; Press appropriate E1 LINE key and select Clock & Frame Slip MEASurement function.	c. BER performance plus E1 Frame & Clock Slips
	VF Frequency & Level Only; Press DS0 CHANNEL or DROP/INSERT key and set up.	d. BER performance plus VF Frequency & Level.
2.	Verify that T-STAR TIME and DATE are correct.	Press TIME DATE key to correct time and date.
3.	Press EVENT LOGGING key (from function selected in STEP 1)	
4.	Press [F2] CLEAR to clear Event Logging Memory.	
5.	Press [F4] LOG to select E input only or E + F.	"E" or "E+W" appears on screen (Not applicable in TERM mode). NOTE: Do not set E+W unless both E and F E1 inputs are patched to E1 circuit.
6.	Press [F4] RATE to select continuous Error Report or to select test time (1 min. to 48 hours).	
7.	Press [F3] ST/FRZ to start test.	

STEP	PROCEDURES	COMMENTS
8.	Press [F5] SCRL to review test results on screen. NOTE: If printer is connected, test results will dump to the printer and NOT to the Event Logging Memory.	See PRINTER function to procedures to print test results

.

V

APPENDIX A

TECHNICAL SPECIFICATIONS

E1 INTERFACE

Signal Format.....	E1 PCM 1.544 Mbps
Interface Modes.....	Terminate
	DSX Monitor
	Bridge
	Drop/Insert

E1 INPUT

Terminate Mode.....	100 Ohms, +6 to -34 dBdsx
DSX Monitor Mode.....	>5k Ohms, 0 to -30 dBdsx
Bridge Mode.....	>5k Ohms, 0 to -30 dBdsx

Signal & Alarm Indicators (E&F)

SIGNAL .....Light green when E1 pulses are detected

FR SYNC .....Light green when frame synchronization is detected and turns off when it is lost

MF SYNC .....Light green when multiframe synchronization is detected and turns off when it is lost

PTR SYNC.....Light green when T-STAR is synchronized with the incoming E1 test pattern and turns off when the synchronization is lost

AIS .....Light red when Alarm Indication Signal(also called all ones alarm) is detected and turns off when the alarm condition disappears.

RM AL-RAI ..... Light yellow when yellow alarm signal is detected. and turns off when the alarm disappears.

USER DEF .....Light red. This indicator is reserved for the user to define from the menu. The menu will be available in the future software version.

EXC0 .....Light red when the average pulse density fall below 12.5%, and turns off when it exceeds or equal 12.5

E1 Test Points (0 or +5 VDC TTL pin jacks)

* Ground
#1 to be defined
#2 " "
#3 " "
#4 " "
#5 " "
#6 " "

E1 OUTPUT

Impedance..... 120 ohms(balanced) or 75 Ohms (unbalanced
Pulse Amplitude..... 4.8 V/p-p (DSX-1 compatible)

Clock Sources

Recovered..... From E1 input signal
Internal*..... Oscillator, 2.048 Mhz (5ppm accuracy)
External*..... 3000 Ohms, TTL

*T-STAR must be set to 100 ohm termination mode

Frame Formats..... CAS(Channel Associated Signaling)
CAS&C (CRC-4)
CCS(Common Channel Signaling)
CCS&C(CRC-4)
Unframed

Line Codes..... AMI, HDB3

Network Interface
LBO (Line Buildout)..... 0, -6, -12 dB
DC LOOP ..... E1 span simplex power loop
Connectors ..... DB-15 and RJ-48C

E1 LINE & SIGNAL MEASUREMENTS

E1 Pulse Measurement.....Level (dBdsx) +3.0 to -40.0 (+/-1 dB)
Level (dBm) +19.0 to -18.0 (+/-1 dB)
Voltage (p-p) +0.06 to 12.0 V (10%)

Frequency Measurements.....Range 2048000 +/-3000 Hz
Resolution .....1 Hz
Accuracy..... 25 ppm
Frame/Clock Slip Counts +/- counts with respect to ref. signal
E1 Span Simplex Current .....0 to 200 mA (+/-10%)

BIT ERROR TEST FUNCTIONS

TEST PATTERNS (Framed/Unframed)
QRSS 2E20-1 bits (no more than 14 consecutive 0's
Pseudorandom (PRBS) 63, 511, 2047, 2E15-1 & 2E20-1 bits
Fixed 1:1 (10)
1:3 (1000)
1:7 (10000000)
1:15 (1 followed by 15 zeros)
2 in 8 (01001000)
3 in 24 (010001000000000000000100)
1:31 (1 followed by 31 zeros)
All Ones (1111)
User defined 8 to 32 bytes (store up to 5 patterns in memory)
Error Injection Auto Logic & BPV errors 10 E-3 to 10 E-8
Frame errors 1:2, 1:5, 1:10, 1:50, 1:100
Manual 1 error at a time (Logic, BPV & FAS)

Bit Error Measurements Logic, Frame, BPV's & CRC

MEASUREMENT FORMATS

Standard.....Bit Errors, Errored Seconds, Error-Free Seconds, Bit Error Rates
CCITT G.821.....Severely Errored Seconds, % Severely Errored Seconds, Degraded Minutes, %,Degraded Minutes, Unavailable Seconds,% Availability, Available Seconds.

TEST LENGTHS

Logic & BPV.....10E5, 10E6, 10E7, 10E8 bits & autoranging
FRAME.....10E3, 10E4, 10E5 bits & autoranging
CRC-6.....10E2, 10E3, 10E4 bits & autoranging

Test Pattern Sync Modes.....Auto & Manual

Timed Tests/Error Logging..... Refer to EVENT LOGGING

Fractional E1 Option
FE1 Rates.....Nx56 or Nx64 kbps
Time Slots .....Contiguous or Non-contiguous

VF FUNCTIONS

Channel Formats .....30 an 32 channel
Frequency Measurements.....300 to 3900 Hz, +3.1 to -97.0 dBm
VF Tones (dBm).....404, 1004, 2804 & 2713 Hz
Idle Test Pattern .....PCM Code 11010101 in A-law and 01111111 in u-Law (selected channel)
VF Input - Impedance .....600 Ohms (+/-10%)

Gain/Loss Adjust .....+7 to -16 dB (set to 0dB in factory)
Max Input Level.....+3 dBm
VF Output - Impedance.....600 Ohms (+/-10%)
Gain/Loss Adjust .....+7 to -16 dB (set to 0dB in factory)
Max Output Level .....+7 dBm
Idle Channel Noise.....20 dBrnC
E/M Signaling Interface.bantam jacks-external control & monitoring
M Lead (A bit) A = 1 (-48VDC) or A = 0 (ground)
E Lead (A bit) Relay Open (a = 0) or Closed (A = 1)
Signaling Bits (ABCD)
Monitor Incoming Bits Single channel (E lead via E/M jack) or All Channels
Control Outgoing Bits Set each bit to logic 1 or 0 (Also M lead via E/M jack).

DIAL FUNCTION

Signaling Types .....DTMF, MF, DP A&B,
Dialed Number Memory File 5 files, 69 characters each
Dialing Modes
Manual.....Character sent when key is pressed.
Auto.....Phone # entered manually or recalled from memory file and sent each time SEND key is pressed.
Repeat.....Phone # entered manually or recalled from memory file. When SEND key is pressed the dialing sequence starts (OFF-HK followed by dial # and a 5 second delay and then ON-HK for 3.3 seconds).

ON-HOOK/OFF-HOOK Standard E&M

DIAL DIGIT DISPLAY OPTION

E1 Access Mode .....DSX Monitor or Bridge
Signaling Modes.....DTMF/MF (with KP), MF or DP A&B
Number of Digits.....Up to 59 displayed simultaneously
DTMF Digits.....0-9, #, *, ABC&D
MF Digits.....0-9,KP(K),ST(S),STP(-),ST2P(=),ST3P(W)

WINK TIMER OPTION

Wink Delay Measurements.....0-9999 milliseconds
Wind Duration Measurements.....0-9999 milliseconds
Number of Measurements for each call test.....Up to 3
Programmable Time Limits.....(1st delay/wink only)
Wink Delay.....0-9999 milliseconds
Wink Duration..... 0-9999 milliseconds
Type of Supervision.....E &M or user programmable
Direction of Seizure.....Automatically displayed for T-STAR Eor F input
Call Answer & Disconnect
Times.....Displayed on screen
Time Out.....Call test function shuts off automatically if a call is not answered in 31 seconds.

Test Setup Modes

Manual Wink timer turns off after each call test and must be restarte manually.

Automatic Wink timer restarts automatically 31 seconds after com tion of each call test (continuous call testing).

External Printer Function Automatically prints call test data displayed on screen when call test stops.

DS0 CHANNEL LOOPBACK

E1 Access Mode.....2-way Drop/Insert (E1 circuit In-Service).

Loopback Directions.....E IN to E OUT, F IN to F OUT, or both directions simultaneously.

SPECIAL FUNCTIONS

Autoconfiguration.....Auto syncs to D4, ESF & Unframed Formats & AMI or B8ZS Line Codes

Event Logging

Alarm Events.....Recorded and date/time stamped as they occur.
Continuous Tests....Bit errors recorded and date/time stamped as they occur.
Timed Tests.....Measurements recorded at end of selected test periods and date/time stamped (tests are repeated until function is turned off).
Time Measurements....Logic, BPV, Frame & CRC error performance with E1 Frequency & Level, or E1 Frequency & Line Current, or Clock & Frame Slips, or VF Channel Frequency & Level.
Error Formats Reported.....Logic, Frame & CRC and CCITT G.821.
Timed Test Period....E1,5,15,30, or 45 minutes & 1,2,3,4,6,9,12,24 o 48 hours.
Test Results Stored in memory and reviewed on LCD screen or transferred to external printer.

CSU Loopback Codes

Standard.....10000 (activate), 100 (deactivate)
User Defined.....Any combination of 1/s & 0's up to 8 bits.
CSU Emulation.....T-STAR internal loopback switch responds to standard CSU loop Up/Down codes.

RS-232C Serial Port (Printer, Video Display Terminal, or Modem).

Baud Rates.....300, 600, 1200, 2400, & 4800
Word Lengths.....7 or 8 bits
Parity.....Odd, Even, or None

Remote Control

Interface..... DEC VT-52/VT-100 or equivalent video terminal
Control.....All test & setup functions

POWER

Input Power.....12 VDC (via rechargeable Battery or 115VAC-14VDC Power Adapter).
Power Consumption.....10.0 Watts, Maximum
Battery.....GEL/CELL; 3 to 5 hours life (under normal operation); 8 to 12 hours recharging time from total discharge to full charge.

PHYSICAL CHARACTERISTIC

Dimensions (inches).....12.5H x 8.25W x 5.0D
Weight.....9.5 lbs (with cover & battery)
Operating Temperature.....0 to +50 degrees C
Storage Temperature.....-40 to +80 degrees C

NOTE: T-STAR 2000 specifications are subject to change without notice.

VI

APPENDIX B

T- STAR PRODUCT WARRANTY

12 MONTH LIMITED WARRANTY

All new T-STAR products come with a 12 MONTH LIMITED WARRANTY which provides that the products Compression Techniques Corporation manufactures will be free from defects in material and workmanship under normal use and service, for a period of 12 months from the date of shipment from the factory. This warranty is limited to the original purchaser and is not transferable. During this 12 month period, Compression Techniques Corporation will repair or replaced, at its option, any defective products or parts at no additional charge to the customer, provided that the defective product or part(s) is returned, shipment insured and prepaid to Compression Techniques Corporation. All replaced products and parts become the property of Compression Techniques Corporation. Replacement parts shall be similar new or serviceable used parts. THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN TAMPERED, REPAIRED (by vendor other than by Compression Techniques Corporation and their authorized distributor), DAMAGES AS A RESULT OF ACCIDENT, MISUSE, ABUSE (such as power surges, incorrect voltages, failure to follow provided operating instructions, "acts of GOD" or any other situations beyond the control of Compression Techniques Corporation), and BATTERIES. Non Compression Techniques Corporation installed parts or components are not covered, nor is damage to Compression Techniques Corporation provided components covered as a result of their installation. Compression Techniques Corporation provides no warranties whatsoever on software. Compression Techniques Corporation makes no warranties or representations on the desirability of customer's use of the T-STAR, or the type of quality of results obtained from using the instrument. Optional extended 36 MONTH LIMITED WARRANTY applies with the same terms and conditions as written above and starts from the date of shipment from factory.

LIMITATIONS OF REMEDIES AND LIABILITIES

COMPRESSION TECHNIQUES CORPORATION'S ENTIRE LIABILITY AND CUSTOMER'S EXCLUSIVE AND SOLE REMEDY FOR DAMAGES FROM ANY CAUSE WHATSOEVER (INCLUDING WITHOUT LIMITATION ANY NONPERFORMANCE, MISREPRESENTATION, OR BREACH OF WARRANTY) SHALL BE LIMITED TO RETURNING THE PRODUCTS PURSUANT TO A TWENTY (20) DAY SATISFACTION GUARANTEE, OR TO REPAIR OR REPLACE THE SPECIFIC PRODUCTS OR SERVICES THAT DO NOT COMPLY WITH THE LIMITED WARRANTY GIVEN BY COMPRESSION TECHNIQUES CORPORATION. Any products or services repaired or replaced by Compression Techniques Corporation pursuant to this paragraph shall be warranted as of the date of shipment in accordance with the terms and conditions herein for the duration of one-year term of Limited Warranty given by Compression Techniques Corporation or TWENTY (20) DAYS, whichever is longer. IN NO EVENT WILL COMPRESSION TECHNIQUES CORPORATION BE LIABLE FOR ANY ECONOMIC LOSS, PHYSICAL INJURY, LOSS OF REVENUES, LOST PROFITS, LOST SAVINGS OR OTHER INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES INCURRED BY ANY PERSON, EVEN IF COMPRESSION TECHNIQUES CORPORATION HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR CLAIMS.

APPENDIX C

BIT ERROR RATE MEASUREMENTS

GENERAL

Bit Error Rate is the ration of errors to total bits tested (i.e. number of bits in error divided by the total number of bits tested). For example, 10 errors in 1 million bits would be expressed as an error rate of: 10.0 E-6 (1.0 E-5).

NOTE: The letter "E" used in the T-STAR display means that the number following is an exponent to the base 10.

In the T-STAR, BER notations are automatically reduced to ONE significant digit (e.g. 2.45E-7 not 24.5E-8), as shown in the following example:

EXAMPLE OF BER CALCULATION (Using Test Length of E7)

No. of Errors = 36 = 36 = 36E-7 = 3.6E-6
(screen display)
Total Bits Tested 10 Million E7

The duration of a bit error rate test (called the test length) can be established by a "bit count" or by a "time period". The T-STAR uses both methods. Remember that "bit error rate" is independent of time or bit counts so any E1 bit error rate test should be run for an extended period (more than 15 minutes) to insure that the test is statistically valid.

The bit error rate notation used in the T-STAR is based on the number of bits counted during the test (if 10 million bits are counted the basic notation will be X.XXE-7, or reduced to one significant digit). To obtain a very low bit error rate of X.XXE-11, for example, requires counting 100 billion bits. At the E1 line rate of 2.048 Mbps, it takes 18 hours to count 100 billion bits.

The Bit Count method in the T-STAR has discrete test lengths of 10E5, 10E6, 10E7 and 10E8 bits for LOGIC & BPV measurements; 10E3, 10E4, and 10E5 for FRAME measurements, and 10E2, 10E3 and 10E5 for CRC measurements. The Time Period method in the T-STAR, associated with the EVENT LOGGING function, has a selection of 14 discrete test times ranging from 1 minute to 48 hours.

The following discussion pertains to LOGIC and BIPOLAR VIOLATIONS bit error rate measurements. However, the comments apply equally to FRAME and CRC bit error rate measurements that use smaller number of bit counts for the E1 test lengths.

BIT COUNT METHOD

Using the ERROR FORMAT and TEST LENGTH keys on the front panel, bit error rates are calculated and displayed using the "bit count" method. In this mode, the TEST Length determines the initial measurement notation displayed on the screen (i.e. with a test length of E7, or 10 million bits, the initial bit error rate notation displayed is 0.00E-7).

Remember that the error rate notation is always maintained to ONE significant digit, so when the calculated error rate exceeds 9.99E-X, the exponent will change accordingly. Example: an error rate of 125E-8 (125 errors in 100 million bits) is displayed as 1.25E-6 (1.25 errors in 1 million bits).

The maximum BPV and LOGIC TEST LENGTH in the T-STAR is E8 which means that corresponding error rates can be displayed up to X.XXE-8 (i.e. number of errors in 100 million bits). It takes over 64 seconds to count 100 million bits. Because of the long waiting time to measure very low bit error rates, error rate measurements greater than E-8 are performed in the T-STAR 1500A EVENT MEMORY function, using time periods rather than bit counts.

Note that the BER notation corresponding to the TEST LENGTH will not appear until the number of TEST LENGTH bits has been received (the longer the test length the longer the delay). It takes over 6 seconds to count E7 E1 bits and over 64 seconds to count E8 E1 bits. If there are no errors during the TEST LENGTH period, the reading will be 0.00E-8 (TL = E8).

When an error occurs, the screen display does not change until the number of bits in the TL has been received. For example, if there were 5 errors during a TL of E8, a reading 5.00E-8 will appear in about 64.77 seconds indicating that the bit error rate is 5 errors in 100 million bits. However, if there were 10 errors instead of 5, the reading would be 1.00E-7 indicating an error rate of 1 error in 10 million bits (note that one significant digit is always maintained in the bit error rate display). If there are no errors during the next TL (TEST LENGTH), the reading will change to 0.00E-8.

Remember that the error rate displayed is valid only for single TL. To obtain a statistically valid BER, the test should extend over a number of test lengths or for an extended period of time. When monitoring circuits with high error rates it is more convenient to use AUTO ranging rather than one of the fixed test length.

In the case of the AUTO TL, the notation tracks the error-free bit counts starting with the shortest test length (e.g. E5) and moves upward (e.g. E8) until errors occur. When errors occur, the TL will adjust automatically from E(X) down to E5 to maintain the displayed error rate at one significant digit.

It is not meaningful to inject errors MANUALLY while observing the BER on screen. If the TL is E5, manually injected errors will not register on the BER display because the time is too short (0.00667 seconds). If you extend the TL, a momentary BER will be displayed (after the TL period) when you inject errors, but again this is not meaningful.

If you inject errors automatically, the TL must be set to be equal to or greater than the error injection rate. For example, if the AUTO INJECT rate is set to E-6 the TL should be set to E6 (or higher). Remember, the notation displayed will still follow the "one significant digit" format. If the TL is less, the BER cannot be measured and will not appear on the screen.

It is suggested that the TL be set to AUTO when injecting errors into a circuit at fixed rates (AUTO INJECT function).

TIME PERIOD METHOD

In the EVENT LOGGING function, bit error rates are calculated using "time periods". The T-STAR has a choice of 14 time periods ranging from 1 minute to 48 hours.

At the end of a selected time period, the AVERAGE BIT ERROR RATE is recorded in memory and can be reviewed on screen or transferred to a printer. To calculate the average error rate, the total number of bits received during the test period are divided into the number of errors counted during the same period. For example, if 1 error is counted over a 24 hour test period, the average error rate will be recorded as 1.33E-11 (1 divided by 1.33E11, i.e. the number of DS 1 bits in 24 hours @ 2.048 Mbps).

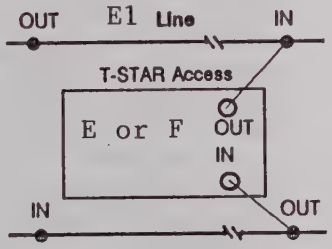
APPENDIX D

E1 INPUT MODES & PATCHING ARRANGEMENTS

E1 MODE INPUT TERMINATIONS (Scroll [F1] TERM key)	E1 CIRCUIT PATCHING ARRANGEMENTS

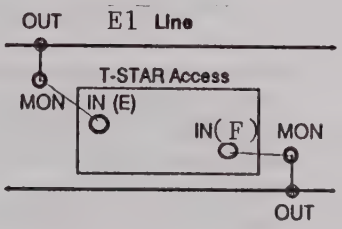
TERMINATION MODE

100-ohm input impedance (+6 to -40 dBdsx range with auto gain control); Terminate E1 line for Out-Of-Service testing; Line looped or terminated at far end; Patch to E or F IN/OUT jack.



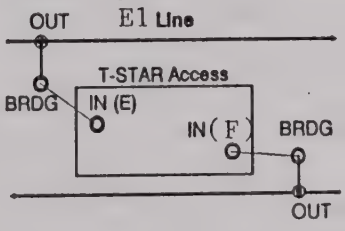
DSX-MONITOR MODE

100-ohm input impedance (0 to -30 dBdsx range); Patch T-STAR E1 IN (E/F) to MONITOR jacks at DSX-1 bay; In-Service monitoring.



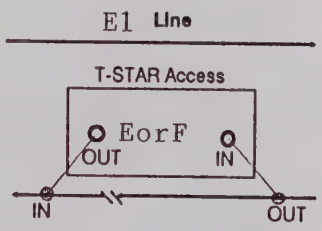
BRIDGING MODE

1000-ohm input impedance (0 to -40 dBdsx range with auto gain control); Patch T-STAR E1 IN (E/F) to bridging test points anywhere on the line; In-Service monitoring.



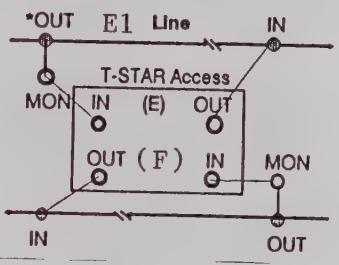
DROP/INSERT-TERM MODE

100-ohm input impedance (+6 to -40 dBdsx range with auto gain control); Terminate E1 line in characteristic impedance for one-way Drop/Insert testing; Patching is SERVICE DISRUPTING use CAUTION; Patch to IN/OUT jacks.



2-WAY DROP/INSERT-MONITOR MODE

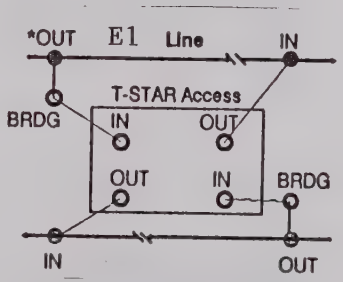
100-ohm input impedance (0 to -30 dBdsx range); Patch E1 IN (E/F) to DSX-1 MON jack; Patch to MON jacks first to achieve frame sync (FR LOSS indicator OFF); Patch to DSX IN jacks (may cause momentary "hit" but should not cause an alarm); Insert 100 ohm termination plug into DSX OUT jacks.



*Insert 120ohm TERM.PLUG.

2-WAY DROP/INSERT-BRIDGE MODE

1000-ohm input impedance (0 to -40 dBdsx range with auto gain control); Patch T-STAR E1 IN (E/F) to bridging jacks; Patch to bridging jacks first to achieve frame sync; Patch circuit to IN jacks (may cause momentary "hit" but should not cause an alarm).



*Insert 120ohm TERM.PLUG.

APPENDIX E

REMOTE CONTROL FUNCTION

DESCRIPTION

The Remote Control Function allows you to operate the T-STAR remotely using a DEC VT-52, VT-100, VT-200, Wyse 85, Wyse 50 or equivalent terminal; or a PC setup to emulate any one of the terminals listed.

The terminal can be connected directly to the RS232C interface connector on the T-STAR, or via a dial-up telephone line with a modem at each end. Once the remote control setup is complete, you can operate all of the T-STAR setup, monitoring, testing and dial functions from the keyboard and monitor of your terminal (or PC).

The setup and operating instructions contained in this appendix assume that you understand the features and functions of the T-STAR, and how it operates.

EQUIPMENT REQUIRED

1. DEC VT-50, VT-100, VT-200, Wyse 85 or 50, or other similar terminal, or a PC (setup to emulate any of the terminal listed).

2. Two HAYES SMARTMODEMS or equivalent dial-up modems.

3. RS232C interconnect cables (Figure E-1).

SETUP INSTRUCTIONS

STEP INSTRUCTIONS

1. Patch T-STAR to E1 line in monitor, out-of-service termination, patching in the drop/insert mode (NOTE: Turn T-STAR on befo patching in the Drop/Insert mode).
2. Connect T/STAR to dial-up modem, via RS232C connector, an turn on modem, or connect directly to terminal and ignore step 3.
3. Connect modem to telephone line.
4. Turn on T-STAR.
5. On T-STAR, press MONITOR or TEST key according to type c test mode (refer to STEP 1 above). T-STAR should default to in setup and autoconfigure to frame format and line code of E1 line.

   If necessary, press E1 MODE key, change default setups and then to return to TEST or MONITOR screen by pressing [F5] EXIT. T-STAR should now be in synchronization with E1 line under test (PULSES lamps ON, FR LOSS) and alarm indicator lamps OFF).
6. Press REMOTE CONTROL set-up key and scroll [F2] BAUD, [F3] BITS and [F4] PARITY to set baud rate, word length and parity to agree with modem/terminal setup.
7. Scroll [F5] TYPE to select type of terminal (DEC VT-52, VT-100, VT-200, Wyse 85, or Wyse 50).

   DO NOT TURN ON REMOTE CONTROL FUNCTION [F1] AT THIS TIME (wait until terminal workstation site setup is completed).
8. Have the remote workstation operator complete the site setup.
9. When the modem signals that the telephone line connection is ready PRESS [F1] to ON.

Remote Terminal Workstation Site Setup

1. Connect cable between terminal and dial-up modem.
2. Connect dial-up modem to telephone line.
3. Turn on terminal and modem.
4. Dial telephone number of the remote modem and confirm that call processing is completed.

When remote control is turned on, the simulated T-STAR screen and the Help menu screen should appear on the terminal display (Figure E-2).

This completes the setup. You can now control the T-STAR remotely.

OPERATING INSTRUCTIONS (TERMINAL)

1. Note the simulated T-STAR SCREEN and the HELP MENU SCREEN displayed on your terminal monitor. Carefully examine the simulated T-STAR screen. The simulated T-STAR screen displays the same information that appears on the screen of the remote T-STAR test set.

When you press a key on your terminal, corresponding to a key on the test set, the change occurs instantly on the screen of the remote test set (i.e. you are controlling the test set in "real time").

The T-STAR test set sends a "PRINT SCREEN" message to the remote terminal continually every 4 or 5 seconds (depending on the type of terminal). This means that there is a short interval between the time that you press one or more keys on the terminal and the time that changes appears on the screen of your monitor.

2. Now, examine the HELP MENU screen. Note that all of the T-STAR front panel keys are identified on the screen followed by a corresponding terminal keyboard letter, number or character in parentheses. Pressing a key on your terminal keyboard produces the same results as if you had pressed a T-STAR front panel key.

The remote control keyboard layout is shown in Figure E-3. Operating the T-STAR from a terminal is easy once you become familiar with the keyboard layout.

3. Proceed to operate the T-STAR from your terminal keyboard, following the same procedures and keystrokes that you use when operating the test set directly.

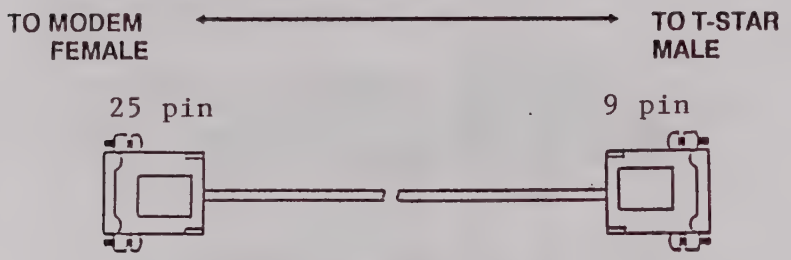
NOTE: Press refresh key [=] if HELP MENU screen is not displayed.

ADDITIONAL HELP

If you need help in setting up the remote control function, or if you are not sure about the suitability of your particular terminal, please call Compression Techniques Corporation directly, or contact your local T-STAR representative.

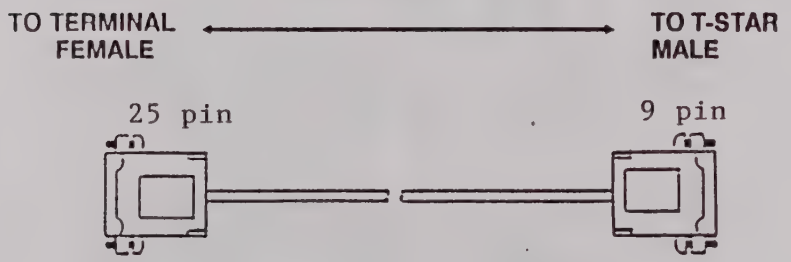
APPENDIX E

CONNECTION VIA DIAL-UP MODEM



Signal	25 Pin	9 Pin	Signal
Shield Ground	1	1	Shield Ground
Transmit Data	2	2	Transmit Data
Receive Data	3	3	Receive Data
Signal Ground	7	5	Signal Ground
Data Terminal Ready	20	4	Data Terminal Ready

DIRECT CONNECTION



Signal	25 Pin	25 Pin	Signal	9Pin
Shield Ground	1	1	Shield Ground	1
Transmit Data	2	3	Receive Data	3
Receive Data	3	2	Transmit Data	2
Signal Ground	7	5, 7, 8, 20	Signal Ground	5

Figure E-1.Interconnect Cable Connections (Pin Assignments)

```
04:17:30MONITOR10:27:94                    HELP MENU SCREEN
DSX-MON   AMI  CAS    RECCLK  FUNCKEYS:  F1A[Z] F2A[C] F3A[B] F4A[M] F5A[,]
                                        F1B[X] F2B[V] F3B[N] F4B[,] F5B[/]
 ------ E ------ F ------
CH: Scr #01  | CH: Scr #01    MONITOR :   LINE [R]     ERR [T]     CHNNL [Y]
FR: 1004 Hz  |
LV:  0.0 dBm |                TEST    :   LINE [Q]     BER [W] DRP/INSRT [E]

                               SET-UP  :   MODE [A] TIME/DATE [F] REMOTE  [H]
                                           SPAN [S] EVENT LOG [D] PRINTER [S]
RX: A=1 B=1  | RX: A=1 B=1    DIAL    :   DIAL [p] DEL   [w] RCL  [e] PAUSE [r]
                                           KP   [t] SEND  [q] ST   [y] STP   [u]
                                           STP2 [i] STP3  [o] 1    [1] 2     [2]
CH-E  CH-F  DS0   ALL    E                 3    [3] 4     [4] 5    [5] 6     [6]
                                           7    [7] 8     [8] 9    [9] 0     [0]
F1    F2    F3    F4     F5                *    [*] #     [#]

                               SPECIAL :   DISPLAY BACKLIGHT [C]  HELP [I]
      T-STAR 2000                          DISPLAY HOLD     [O]  REFRESH [=]
    Remote Control                         PRINT SCREEN     [P]
Compression Techniques                     RESTART          [U]
Corporation (c) 1994
```

Figure E-3. Terminal Display Showing Sample T-STAR screen and HELP MENU screen. (NOTE: In sample screen T-STAR has been set to MONITOR DS0 CHANNEL mode).

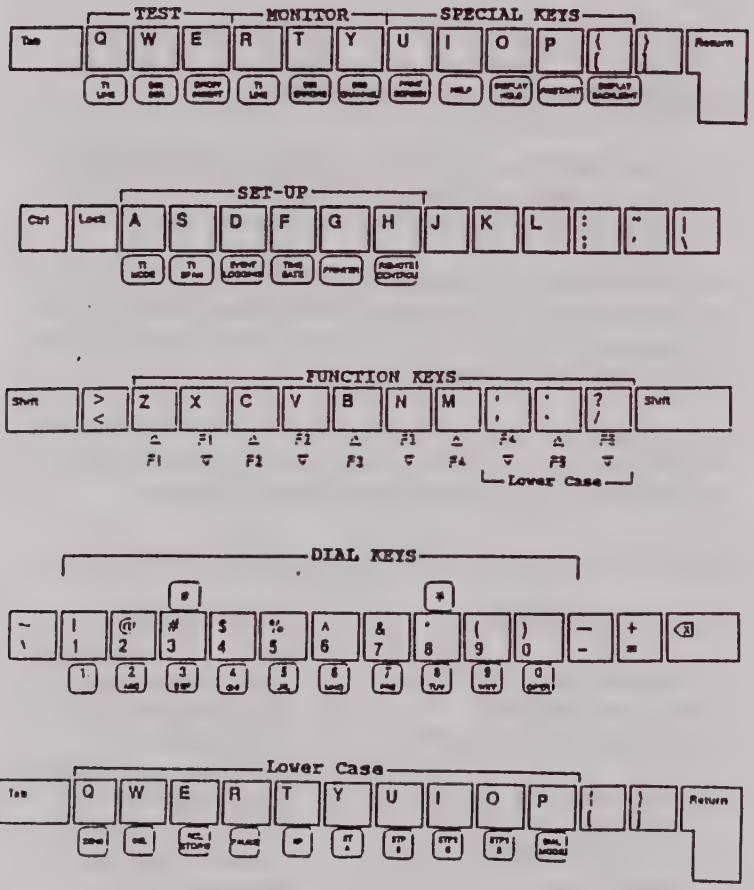


Figure E-3. T-STAR to Video Display Terminal Keyboard Conversion Chart.
X

APPENDIX F

DIALED DIGIT DISPLAY OPTION

The Dialed-Digit Display option allows you to decode and display dialed digits appearing in any selected VF channel of a E1 circuit. The option supports DTMF, MF and DP A&B signaling modes.

Decoded signaling digits, including MF KP/ST control codes, are displayed in real time as they are detected in the selected channel. Up to 59 digits can be displayed on screen simultaneously. The digits remain on screen until erased manually.

The Dialed-Digit Display option is operated in the MONITOR mode of the T-STAR , with the T-STAR patched to DSX-MON jacks or bridging test points on one or both sides of E1 circuit (E/F inputs).

Operating Procedures (DS0 Channel Monitoring)

STEP	PROCEDURES	COMMENTS
1.	Turn power on T-STAR and patch E1 IN to monitor or bridging jacks of E1 circuit.	Observe auto setups. If you patched to bridging test point, press E1 MODE key and set input mode to BRIDGE.
2.	Press MONITOR DS0 CHANNEL key.	
3.	Press DIAL MODE key on the DIAL key pad.	Dialed-Digit Display screen appears.
4.	Scroll [F1] CH to select test channel (01-24).	Note that channel signaling bit status (idle or busy) on screen.
5.	Scroll [F2] to AUTO, E or F to select test direction (defaults to E when AUTO is selected).	In AUTO mode, T-STAR will monitor calls (ON/OFF-HOOK) originating from either E or F direction.

6. Scroll [F5] to select signaling mode DP/A&B, MF or DTMF/MF.

7. Press [F4] ON to start (note that [F4] changes to OFF).

   Dialed digits & MF KP/ST codes appear on screen as they are detected in the channel and decoded.

8. Scroll [F1] CH to change channel or [F4] CLR to erase screen.

9. Press [F4] OFF to turn off, and [F5] EXIT (return to DS0 screen).

Specifications

DTMF

Frequency Detect Bandwidth	Min: +/-(1.5 + 2Hz) %of Fo* Typ: +/-2.3% of Fo* Max: +/-3.5% of F o*
Amplitude for Detection	Min: -32 dBm ref. to 60-0 ohm Max: -2 dBm ref. to 600 ohm
Minimum Acceptable Twist	Twist High Tone Min: -10 dB Low Tone Max: +10 dB
60 Hz Tolerance	Max: 0.8 Vrms
Tone Time ..for detection ..for rejection	Min: 40 ms Max: 20 ms
Pause Time ...for detection ...for rejection	Min: 40 ms Max: 20 ms
Detect Time	Min: 25 ms Max: 46 ms
Release Time	Min: 35 ms Max: 50 ms

Detection Frequency in Hz

		Col 0	Col 1	Col 2	Col 3
		1209	1336	1477	1633
Row 0	697	1	2	3	A
Row 1	770	4	5	6	B
Row 2	852	7	8	9	C
Row 3	941	*	0	#	D

DTMF Dialing Matrix

DIAL PULSE A&B

Break Recognition	Min: 45 ms. Max: 85 ms
Make Recognition	Min: 30 ms. Max: 65
Interdigit Time	Min: 285 ms. Max: 315 ms
Off-Hook Delay	Min: 95 ms. Max: 105 ms
On-Hook Delay	Min: 285 ms. Max: 315 ms

MF

Tone Time	KP, detect Min: 55 ms LKP = 5VDC reject Max: 30 ms KP, detect Min: 30 ms LKP = 0VDC reject Max: 10 ms
Tone Time	detect Min: 30 ms reject Max: 10 ms
Pause Time	detect Min: 20 ms reject Max: 10 ms
Minimum Strobe Pulse Width	High Min: 20 ms Low Min: 2 ms
Minimum Strobe Separation	High Min: 20 ms Low Min: 2 ms
Frequency for Detect Tolerance	+/- (0.015xF0 +5) Hz*
Amplitude for Detect	Min: -25 dBm or 0.123 Vpp Max: 0 dBm or 2.191 Vpp
Twist Tolerance (high/low tone)	Min: -6 dB. Max: +6 dB
Third MF Tone Reject Amplitude	Min: -15 dB
60 Hz Tolerance	Min: 81 dBrn or 0.777 Vpp
180 Hz Tolerance	Min: 68 dBrn or 0.174 Vpp

XI

APPENDIX G

FRACTIONAL E1 OPTION

The Fractional E1 option allows you to set up the T-STAR to perform Out-Of-Service bit error rate tests on fractional E1 circuits. You can test FE1 circuit containing any combination of 56 or 64 kbps contiguous or non-contiguous time slots.

BERT test patterns can be transmitted over single or multiple DS0 time slots, or they can be distributed over all of the time slots assigned to the FE1 service. Unused time slots are filled with All Ones to satisfy the E1 "pulse density" requirements. The FE1 (Fractional E1) option is a setup function only. After the setup is completed, bit error testing is performed using the same procedures described for full E1 testing.

Setup Procedures

STEP	PROCEDURES	COMMENTS
1.	Turn power switch to On.	
2.	Patch T-STAR to the FE1 test access port, in TERM mode, using the E1 E IN/OUT jacks.	Loop the FE1 circuit at far end test access point.
3.	Press the TEST E1 BER key.	E1-BER test screen appears.
4.	Press [F5] FE1 key to activate fractional E1 setup screen.	FE1 setup screen appears.
5.	Toggle [F3] TYPE to "56" or "64".	Select nx56 or nx64 kbps time

NOTE: The next step involves selecting the FE1 channels (time slots) that you wish to test. FE1 channel numbers are entered progressively using [F1] CH and [F2] NEXT key.

STEP	PROCEDURE	COMMENTS.
6.	Scroll [F1] CH to select the first channel number.	Observe channel # on screen
7.	Press [F2] NEXT to advance channel selector to next position. Scroll [F1] CH to select the second channel number.	Repeat thi sprocess until all of the FT1 channel numbers have been selected
8.	If you need to erase the channel [F2] CLR.	
9.	When setup is completed, press [F4] ON to activate the FE1 fun ction. [F4] changes to OFF.	[F1],[F2],and [F3] menus disappear from screen
10.	Press [F5] EXIT to return to the E1 BER test screen.	BER testing can now be performed on the ET1 circuit using the same test procedures described for full E1 BER testing

NOTE: If you observe excessive bit errors during the test you may want to test each channel individual to verify continually of each channel assigned to the FE1 service.

When FE1 BER testing is completed press [F5] FE1 on E1 BER screen to return to the FE1 screen.

Note: it may take up to 90 secinds to synchronize with the test pattern, depending on the number of time slots selected(the fewer the number of timeslots, the longer the delay)

11. Toggle [F4] OFF to turn off FE1 setup function.

12. Press [F5] EXIT to return to E1 BER screen.

APPENDIX H

WINK TIMER OPTION

The WINK TIMER option allows T-STAR users to test the wink-start signaling operation in 2-way E1 trunk circuits. The function operates in the In-Service MONITOR mode of the T-STAR.

The wink timer measures WINK DELAY (time of seizure to start of wink) and WINK DURATION (length of wink start signal) in milliseconds. The maximum allowable time limits for wink delay and wink duration can be programmed to match the specifications of your switching equipment.

When the maximum allowable time limits are exceeded during a test, a NO WINK or GLARE fault message appears on screen of the T-STAR. The NO WINK message indicates that a wink-start signal was not received in the specified time. The GLARE message indicates that the duration of the wink start signal exceeded the specified time.

Up to 3 wink-start events can be measured during each call test. However, the NO WINK or GLARE limits apply only to the first wink.

In addition to wink event measurements, the T-STAR displays the direction of seizure (Eor F) input) and the call answer and disconnect times for each test.

Hardcopy records of call tests can be obtained by activating the printer function of the T-STAR and attaching an external printer. All information displayed on screen is passed to the printer automatically when a call test stops.

Operating Procedures

STEP	PROCEDURES	COMMENTS
1.	Turn power switch to ON and patch T-STAR E1 E & F IN jacks to monitor or bridging jacks of E1 circuit (both sides of line).	For hardcopy records of test results, connect printer to T-STAR and setup PRINTER function.
2.	Press MONITOR DS0 CHANNEL key.	Observe auto setups at top of screen. If you are connected to bridging test points, press E1 MODE key and set input mode to BRIDGE
3.	Press [F3] WINK to activate the wink timer option.	

WINK TIMER SETUP

1.	Scroll [F3] to x1000, x100, x10, or x1 and then set NO WINK & GLARE DETECT time limits by scrolling [F1] NWNK and [F2] GLDT (times displayed on screen).	This sets the counting steps for setting wink delay (NO WINK) and wink duration (GLARE DETECT) time limits in milliseconds (0-9999 ms). If E & M supervision is o.k., proceed to Step 3
2.	T-STAR defaults to standard E&M signaling format (AB or BUSY supervision). To program another format, toggle [F4] TYPE. Scroll [F1] thru [F4] to set IDLE-BUSY supervision format for E & F inputs. Press [F5] EXIT to return to wink timer set-up screen.	SIGNAL TYPE: UDF (user defined format) appears on screen.
3.	When setup is completed, press [F5] EXIT to display WINK TIMER test screen.	

STEP	PROCEDURE	COMMENTS
	Test Procedures	
1.	Scroll [F1] UP/DOWN key to se NOTE: Press [F4] SET-UP if you need to return to setup screen.	Channel number displayed on screen.
2.	Toggle [F3] MODE to select manual (MAN) or automatic (AUTO) test mode.	In MANual mode, wink timer turns off after one call and must be restarted manually.
	*Delay allows time to review test results on screen and for automatic printer functions to complete printing.	In AUTOmatic mode, wink timer restarts automatically after 31 seconds*.
3.	Pres [F2] START to start the wink timer. [F2] changes to STOP and all other menus disappear from screen. The wink timer test stops automatically when one of the fol lowing events occur:	When a line is seized, E or F appears on screen to indicated direction of seizure.
a.	NO WINK or GLARE fault condition detected.	Fault message appears on screen.
b.	TIME OUT (call is not answered in 31 seconds).	"[TIME OUT]" message appears on screen.
c.	DISCONNECT signal detected	Note that call ANSWER and DISCONNECT times are displayed on screen.
	If printer is used, a screen print will occur automatically when wink timer test stops.	[PRINTER]" message appears on screen to indicate that printer function is ON.
	The wink timer will restart automatcally after 31 seconds if set to AUTO test mode.	

4. Press [F2] STOP to stop test manually.

5. When testing is completed, press [F5] EXIT to return to DS0 CHANNEL screen.

APPENDIX I

DIGITAL SIGNAL PROCESSING OPTION

DESCRIPTION

The digital signal processing option provides the following VF measurements:

C-Message weighed filter of the VF signal
C-Notched Filter
Signal-to-Noise ratio

The C-message and C-notched filters meet IEEE Standard 743, 1984, and are entirely digital. As such, they do not require any calibration.

OPERATION

The DSP function is available only in DROP/INSERT test mode ,but termination type has to be TERM. D/I TERM, D/I BRGD or D/I DSXM are not allowed.

Connection:

1. Connect the E(or F) E1 Input to the OUT jack of the DSX-1 crossconnect .
2. Toggle [F5] SIDE key to set the corresponding E or F side for VF test.

. Make sure that the message on the screen in the left top corner reads TERM. If it is different, depress [Mode] key under SETUP and scroll [F1] until TERM appears and EXIT depressing [F5].

3. Scroll [F3] SEND key until "SEND:1004" appears on the bottom of the screen.

4. Scroll [F3] MEASURE key until the screen displays:

--------C-Message----------

Cm:	90.0	dBrnC
Cm:	51.0	dBrnC
SN:	39.0	dBrnC

C-message data shown here is just anexample

5. Wait until the results appear in the C-message window. The calculation takes about 7 seconds to process. In the meantime, the keyboard will be locked to prevent the interruption of the function.

6. After the results are displayed, the keyboard is unlocked and the function can restarted by pressing [F1] RESTART or exiting by pressing [F5] EXIT.

APPENDIX J

Pulse Shape Analysis Option

This test can be performed only from the LINE menu under the TEST section of the keyboard.
The unit has to be set up as follows:

1. Line termination set to TERM
2. Frame and Line code to match the requirement of the T1 transmission equipment
3. Transmit Clock Source: Internal or Recovered
4. Using Printer menu under SETUP set the printer to:
   ON
   4800 Baud
   No parity
   8 Bit

After this set up press EXIT which will return the menu to LINE.
To start pulse shape analysis press
[F3] up PULS
Now, depending on the type of signal:
a message CB119 appears for T1 and G.703 for E1, under MASK
(type of pulse shape template)
This option will analyse only positive pulses with a preset test pattern of 1:7(01000000).
The function keys available are:
[F2] MASK - allows analysis of the pulse shape without the mask .
[F3] START - starts the test
[F5] EXIT - allows exit from the option. If the printer is in process of printing a warning appears before the actual exit.

To continue the test press [F3] START and wait untill the graph of the template and the pulse is plotted n the screen. If the waiting exceeds 12 seconds , a message appears " No Match Found", which means that the pulse is impossible to reconstruct.

After the successful plotting of the graph, a new submenu appears with function keys defined as follows:

[F3] RSLT -Results displays analysis results on the screen and invokes a new submenu defined as follows:

[F4] PRINT - Print the Pulse on the Mask(if mask is ON) and the Results. If th eprinter is OFF a warning will appear .

[F5] EXIT - Return to previous screen .

This end s the operation of the option.

NOTE: The printer required to plot the graph is a special thermal type, which can be purchased from Compression Techniques directly or from an Epson dealer. The Model is P-40. Since the printing is perfomed in the graphics mode, other printer are not supported at this time.

APPENDIX K

Propagation Delay Option

This option allows a measurement of the round trip propagation delay of the signal sent from the T-Star 2000 to the remote end, looped and recieved by the same T-Star.

To set this test select LINE menu under the TEST section of the keyboard.

> The default T-Star set up will be TERM, Internal Clock . The Frame and Code will be automatically configured or manually selected . See Operation part of the manual for details.

Next, scroll key [F3] dn - Measure unitl the parameter "Propagation" appears on the screen. At this point the propagation delay measurement has started and will display results continuously , as long as the option is on the screen.

The measurement is displayed in x.xx miliseconds.
The range is from 1 to 999 miliseconds
Th e resolution is 1milisecond.
The accuracy is +/- 1 miliseconds.

Higher resolution and accuracy will be available in future software releases.

MP MASTER
MA32203

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